RA407.5
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1964

DEPARTMENT OF HEALTH
SPECIAL REPORT SERIES

17

INFANT AND FOETAL LOSS IN NEW ZEALAND

Issued by the Medical Statistics Branch
of the Department of Health
Wellington, New Zealand

1964

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DEPARTMENT OF HEALTH

INFANT AND FOETAL LOSS IN NEW ZEALAND

by

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Medical Statistician

SPECIAL REPORT No. 17

Issued by the Medical Statistics Branch
Department of Health, Wellington
October 1964

R. E. OWEN, GOVERNMENT PRINTER, WELLINGTON, NEW ZEALAND—1964

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The opinions expressed in this report are those of the author and do not necessarily represent the views of the Department of Health.

F O R E W O R D

This Report places on record as far as is possible all the available statistical information on infant mortality in New Zealand.

New Zealand has reason to be proud of its infant mortality record in the international field. Nevertheless there is no room for complacency and over more recent years several other countries have shown figures which improve on those for this country. The author, Mr.R.J.Rose, has in the course of a WHO fellowship tour looked into the background of the figures produced by the Netherlands, Sweden and Norway. It would appear that national attitudes and statistical practices which differ from those applying in New Zealand may account for part at least of the gap between the infant mortality rates for these and other countries and that for New Zealand.

In the earlier years of the recorded statistics, there was a significant difference between the rates of infant loss of the two principal races in New Zealand - Maori and European. While this disparity still remains in favour of the European, the Maori infant mortality shows a very great improvement in recent years. Nevertheless much remains to be done in the reduction of the Maori rate loss and this Report is a valuable statistical document in illustration of the problem.

Peri-natal mortality, covering early foetal deaths and stillbirths as well as deaths of infants in the period shortly after death, is another aspect of the total infant loss picture which is dealt with competently.

Mr. Rose is to be commended for his initiative in assembling all this material bearing on the infant mortality problem. This Report will prove an excellent book of reference for health administrators, physicians, students and those Societies concerned with infant and maternal welfare in New Zealand.

H. B. Turbott.

(H. B. Turbott)
Director-General of Health.

Inset 1

DEFINITIONS

Infant Death:	Live born infant dying before the first year of life.
Neonatal Death:	Live born infant dying before the 28th day of life.
Early Neonatal Death:	Live born infant dying before the 7th day of life.
Post Neonatal Death:	Live born infant dying between the 28th day through to the first year of life.
Foetal Death:	Products of conception in which there was no attempt at respiration, or any other evidence of life such as beating of the heart, pulsation of the umbilical cord or movement of voluntary muscles.
Early Foetal Death:	As defined above under "Foetal Death" but of less than 20 weeks gestation.
Intermediate Foetal Death:	As defined above under "Foetal Death" but of less than 28, but more than 20 weeks gestation.
Stillbirth (or Late Foetal Death:)	As defined above under "Foetal Death" but of 28 or more weeks gestation.
Perinatal Deaths:	Foetal deaths of 28 weeks or more gestation (stillbirths) plus infant deaths under 7 days of life (early neonatal deaths).

Rates

Per 1,000 live births	Infant, and neonatal deaths.
Per 1,000 total births (live and stillbirths)	Stillbirths (or late foetal deaths) and perinatal deaths.

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INFANT AND FOETAL LOSS IN NEW ZEALAND

SECTION 1 - INTRODUCTION

The primary purpose of this report is to provide a comprehensive statistical record of the infant mortality problem in New Zealand as revealed by the national vital statistics over the last half century. The position of New Zealand internationally is shown where comparative figures are available and in particular three countries which now have lower infant mortality rates than New Zealand have been compared in some detail in respect of the causes of infant loss.

This report is complementary to an earlier number in this Special Report Series (No.1) entitled "European Maori Standards of Health" which gave a racial comparison for all diseases other than those peculiar to the first year of life.

The figures for European and Maori infant-mortality are surveyed in separate sections. To facilitate racial comparisons the Maori and European figures together with those for the total population are shown in juxtaposition in the Maori section.

Because they are relevant to much of the material contained in this report, the main findings of a field study on Maori households in relation to infant mortality, carried out by the Department in 1954, have been included but with a different method of presentation with emphasis on the relative importance of the causal factors.

Perinatal mortality, a comparatively new concept, combining deaths which occur before birth, during labour, or shortly after birth, is surveyed in a section of its own.

Two other aspects of natality directly or indirectly associated with foetal and infant wastage are the birth weights of babies, and high fertility in the Maori. These are also discussed in separate sections.

1.1 The Significance of an Infant Mortality Rate.

The rate of infant loss is recognised as being a very sensitive index of the healthiness of a country. It may also provide an indication of the level of hygiene, and measure such factors as living standards, the availability and utilization of ante-natal and post-natal facilities, and the efficiency of hospital and obstetrical services. Certain other influences such as family planning and the quality of maternal care in the feeding, clothing and hygienic protection of infants may also be reflected in the infant mortality rate.

1.2 Why the European and Maori Figures are Separated.

The infant mortality figures for the European and Maori races are presented in separate sections of this report. For perinatal mortality the one section covers the figures for each of the two races as well as combined figures where Maori data is available.

In completeness of registration of both births and deaths and in the precise reporting of causes of death the Maori standard of today is similar to that of the European. This has not always been so and the improvement in recent years has been mainly due to the growing proportion of both confinements and deaths which take place in hospitals. The factor which makes for slightly less accuracy in statistics of causes of death in the Maori is the smaller proportion of postmortem examinations carried out in the case of deaths from natural causes. This is due in part to the traditional Maori objection to interference with a body after death allied to the fact that more Maori deaths occur in rural districts where the services of a pathologist are not available.

Maori infant death rates compare unfavourably with those of the European being three times as high during the average of the last ten years, but because the Maori is considerably outnumbered by the European the effect of combining the figures for the two races for 1962 is to produce a total rate of only 20 per 1,000 live-births as against a rate of 18 in the European. However in actual numbers 1 death in every 4 deaths in infancy is of a Maori baby while the 1962 Maori rate of 39 per thousand born is over twice that of the European.

It is this large disparity which justifies a racial division. The principal aim of studies such as these is to highlight those places where health education measures could be extended or implemented and undoubtedly it is in the Maori that the greater opportunity offers for preventive measures to be effective. Furthermore there are advantages in the research field in being able to separate out a section of the population in which the incidence of disease is higher in most conditions.

It is less easy to justify a racial division when the New Zealand infant mortality loss is being compared with that of other countries. However the combined European-Maori infant mortality rate is appreciably higher than the rate for the European alone, and when this figure is compared with the rates in other countries which possess no aboriginal population, New Zealand is placed in a most unfavourable relative position. Among persons outside New Zealand who were unaware of the very special problems which exist in Maori health an erroneous impression as to the standard of New Zealand's health and maternal and infant welfare services could become widespread.

1.3 Neonatal and Post-Neonatal Mortality.

When examining infant loss in detail it is essential to divide it into two parts - those deaths which occur in the first month of life (neonatal deaths) and those which occur in the remaining eleven months (post-neonatal deaths). The principal reason for this is that the causes of death differ markedly as age advances, neonatal deaths being largely due to ante-natal and obstetrical factors while with post-neonatal deaths the emphasis is on external influences, principally infections, to which the growing baby is particularly vulnerable.

Both the European and Maori figures in this report are examined as total infant mortality (under one year), neonatal mortality (under 28 days) and post-neonatal mortality (28 days and under one year).

1.4 International Comparisons in Infant Death Rates.

International comparisons of the published rates of infant, neonatal, and post-neonatal loss for a number of countries are supplied in subsections of this report. In addition comparisons in specific causes of death at both neonatal and post-neonatal ages have been made between the four large countries which have the lowest rates in the world, the Netherlands, Sweden, Norway and New Zealand. One other European country, Denmark, from which data was obtained by special request has also been included.

International comparisons can be misleading. It is emphasised that both burial practices and statistical definitions differ as between countries and these can have an influence on infant mortality figures, particularly the neonatal rate. While "live birth" has not been defined legally in New Zealand, in actual practice the World Health Organization definition applies and is included in the Manual of General Instructions to Registrars as well as being entered on the Birth Notification Form. This definition states:

"Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live-born".

All live-born infants according to the above definition should be registered and counted as such in New Zealand irrespective of the period of gestation, or whether alive or dead at the time of registration, and if they should die at any time following birth they should also be registered and counted as deaths.

The definition of "foetal death" follows by corollary with live birth and is stated as:

"Foetal death is death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles".

In New Zealand certificates of causes of foetal deaths are to be furnished for the following two categories:-

Those of less than 28 but more than 20 completed weeks of gestation called "intermediate foetal deaths".

Those of 28 or more completed weeks of gestation called "late foetal deaths". Late foetal deaths are termed stillbirths in New Zealand and as such are required to be registered in exactly the same way as would a live birth.

Not all countries apply the WHO definitions for live birth and foetal death and as a result an event which in one country becomes a live birth and an infant death, in another country becomes a stillbirth. Both Sweden and Canada for example up until 1960 adopted a criterion whereby breathing was taken as the only evidence of life and an infant which showed other signs of life as set out in the generally accepted definition would in these two countries have been included as a stillbirth. Again in the Netherlands a liveborn infant of less than 28 weeks gestation which dies before registration is excluded from being registered both as a live birth and an infant death. The effect of applying either the previous Swedish or the current Netherlands criterion to the New Zealand material would be to reduce the infant mortality rate considerably by 2 points at the least.

An estimate of the probable effect of local registration systems on the infant and the neonatal rates for Sweden and the Netherlands is contained in the text in subsections 2.2 and 2.6.

A table in subsection 2.9 attempts comparisons by individual causes in neonatal mortality between New Zealand, the Netherlands, Norway, Sweden and Denmark. There are obvious discrepancies in the recorded rates by disease which must indicate that there is lack of agreement between countries as to the meaning of terms, in addition to the influence of different registration practices.

1.5 Perinatal Mortality.

Pregnancy usually results in an infant born alive and less often the foetus is delivered stillborn. A proportion of the infants born alive have little chance of survival and die shortly after birth. Few indeed of these babies which die close to the day of birth die from diseases acquired after birth (notably infections) and with most of them the underlying cause is ante-natal or obstetrical.

Registration requirements differ in New Zealand as between the baby born dead and the baby born alive but which succumbs soon after birth. A stillbirth after the expiration of the twenty-eighth week of pregnancy is registered in all respects as a birth but a certificate of cause of stillbirth must also be furnished by the doctor or midwife in attendance at the confinement. The baby deemed to have been born alive but which fails to survive must also be registered as a birth and also as a death, with of course the certificate of causes of death issued by a medical practitioner.

Each year in New Zealand some 900 babies are born dead while some 820 babies born alive die in the first week of life; around 470 of these 820 babies dying in the first week die within 24 hours of birth. When we combine stillbirths with early neonatal deaths (under 1 week) we have a total infant loss in the perinatal period of 1,700 babies. Perinatal mortality thus covers deaths of infants just before, during or just after the process of birth. The perinatal mortality rate is the proportion of deaths in the perinatal period per 1,000 total births (i.e. sum of live births plus stillbirths).

Most perinatal deaths take place while the mother and child are in the care of the obstetrician and before the exogenous factors which the child must resist to survive have made their presence felt. Furthermore since almost all deliveries take place in a hospital, perinatal mortality is in large part a hospital problem.

The major distinction between foetal deaths and those deaths which occur in the first week of life has already been mentioned. In the one group a cause of stillbirth (or foetal death) certificate is issued and in the second group a cause of death certificate is issued. The stillbirth certificate provides for the recording of those morbid conditions in the foetus and in the mother which have led to the death; the death certificate provides for the setting down of the conditions in the infant which caused

death but does not always encourage the setting down of what may be the real underlying condition which is in the mother. For example one common omission from death certificates furnished for newborn babies is the condition in the mother which produced a premature delivery or underlying factors like abnormalities of the placenta and cord.

Obviously if statistics are to be of practical use in the prevention of infant wastage then it is essential to have a full knowledge of all the prenatal and natal factors which can cause infant death. At present, with not only different recording certificates but also different classifications applied to each group which make up total perinatal loss, the value of infant death statistics is limited.

A code has already been framed which combines the causes of death in late foetal deaths (stillbirths) and in early neonatal deaths and this has been utilized in an analysis of the 1961 perinatal material (see Section 4). However it is difficult to foresee much real progress until both groups employ the same death certificate so that the essential information as to the true underlying causes will be elicited.

There is one further very great advantage possessed by perinatal rates. In the previous sub-section attention was drawn to the differences in definition of both live and stillbirth in some countries and the effect on the infant mortality rate. The combining of neonatal figures with stillbirth figures under the one heading of perinatal mortality eliminates the effect of registration differences by which in one country the pregnancy ends in a foetal death and in another country the very same event ends in an early neonatal death.

SECTION 2 - EUROPEAN INFANT LOSS

2.1 European Infant Mortality - Numbers and Rates.

There is a great risk of dying attached to the first year of life. The chances of a New Zealand born European baby dying before its first birthday are approximately 1 in 44 if a male and 1 in 58 if a female. The greatest probability of dying exists in the first few days after birth for a European baby and diminishes with the passing of the weeks. The expectation of life increases for those infants who live through to the first birthday by 0.59 of a year for a male baby and 0.29 for a female.

An infant in vital statistics is a child under 1 year old and the infant mortality rate is the number of deaths registered at these ages during a period (usually one year) expressed as a proportion of every 1,000 live births registered during the same period.

Appendix Table A contains an age breakdown of the absolute numbers and the age-specific rates for infant deaths in each year since 1921 while Table 4, subsection 2.3 averages the rates over eight quinquennia. The consistant downward trend in the European infant rate is clearly illustrated in graph form in Figure 1 on page 6.

The details of deaths of infants under one year of age for each of the last ten years are shown in the following table.

TABLE 1 - EUROPEAN INFANT MORTALITY, 1953-62 - NUMBERS AND RATES BY SEX.

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Males					
Numbers	549	556	599	542	605	608	609	612	655	610
Rates per 1,000 liveborn	23.0	22.3	23.3	20.8	22.8	22.0	21.7	21.5	22.2	20.7
					Females					
Numbers	382	412	403	436	431	435	480	478	449	424
Rates per 1,000 liveborn	16.9	17.6	16.6	17.9	17.0	16.7	18.0	17.7	15.9	15.1
					Both Sexes					
Numbers	931	968	1,002	978	1,036	1,043	1,089	1,090	1,104	1,034
Rates per 1,000 liveborn	20.1	20.0	20.1	19.4	20.0	19.4	19.9	19.7	19.1	18.0

The male death rate exceeds the female death rate during the first few years of life and this phenomenon tends to counter-balance the male excess in births. Averaged over the ten year period there was proportionately a 28 per cent higher mortality among males than among females.

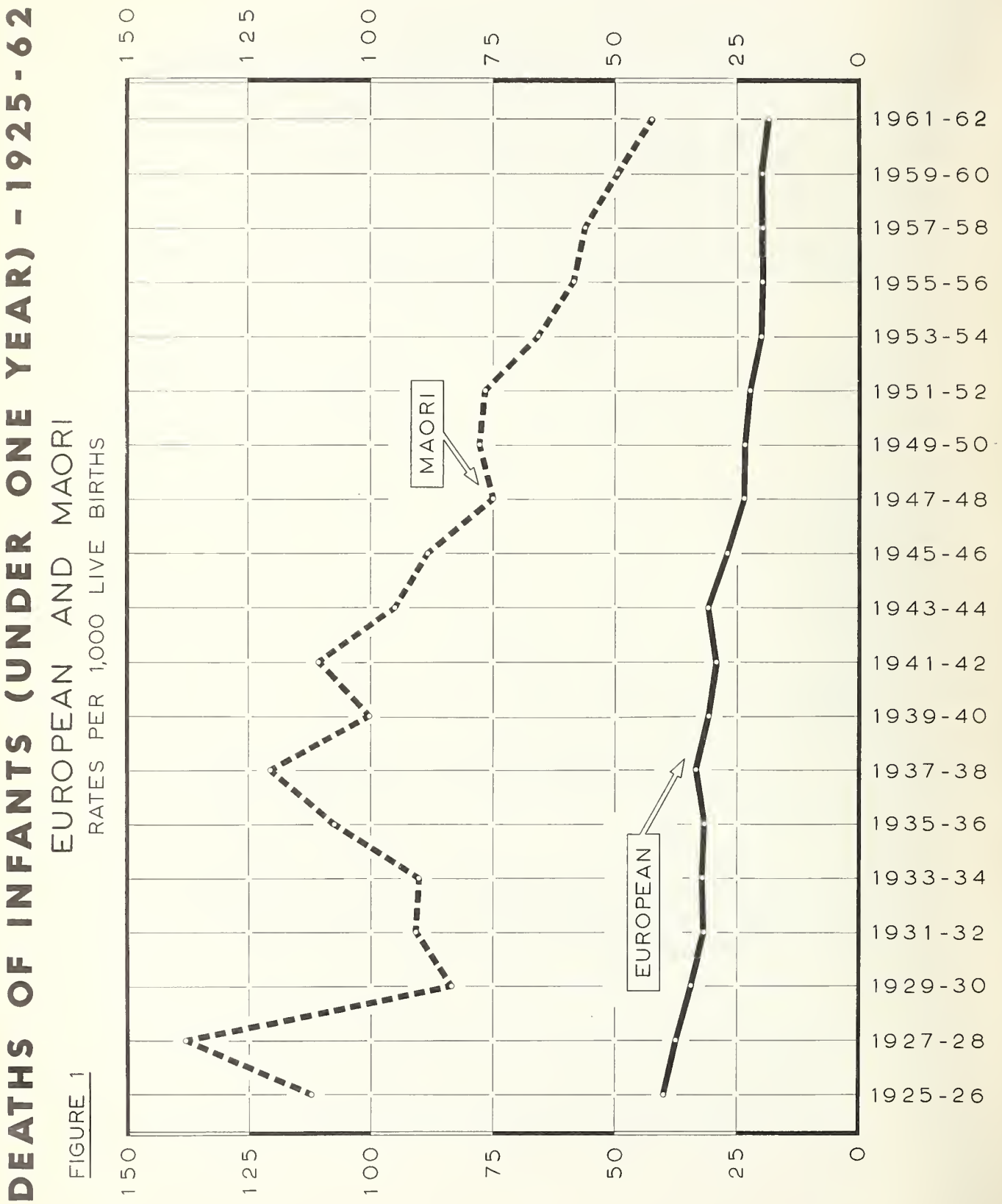
There has been a slow but nevertheless steady decline in the both sexes rate over the last few years and the figure for 1962 of exactly 18 per thousand liveborn is the lowest so far recorded in the history of New Zealand, the reduction of 1 death per thousand over the 1961 level being quite remarkable. Between 1953-57 and 1958-62 the male rate declined by 3.6 per cent whereas the female rate has fallen by 2.9 per cent; in both sexes combined the drop over the two quinquennia has been 3.5 per cent.

2.2 European Infant Mortality - International Comparison in Rates

In the list of infant mortality rates for all countries, the New Zealand European rate holds fourth ranking over the latest two year period 1961-62. One of the three countries (Iceland) with the advantage over New Zealand (the other two are Sweden and the Netherlands) has an extremely small total of infant deaths and the rate is subject to fluctuation.

For the greater part of the first half of this century New Zealand's figures for infant loss among the European section of the population were unchallenged. This is illustrated in Table 2. The proud position

Infant Mortality Rates (Under one Year)
1925-62 - European and Maori.



attained was attributed to a combination of climate, virility of race and low population density, but perhaps the greatest single factor was the adoption of a system of baby care in this country, namely the Plunket system, of which New Zealand is justifiably proud.

Throughout the World War II years 1939 to 1945 the New Zealand European rate remained fairly steady whereas that for Sweden, a neutral country, declined steeply. In 1943 Sweden produced a rate lower than that for New Zealand but New Zealand regained its former leading position in each of the following five years 1944 to 1948. Since 1949 the Swedish rate has always been the lower, declining by about 9 per thousand liveborn as against a New Zealand drop of 5 per thousand liveborn during the period.

The Netherlands, which had made extraordinary progress in the reduction of its infant death rate over the post-war years, became in 1956 the second country to improve on the New Zealand European rate and has in four years 1957, 1960, 1961 and 1962 shown rates which are the world's lowest. However, while there are qualifications to published Dutch infant mortality rates, their claim to be in the top rank of countries with low rates cannot be disputed. This is all the more creditable since home confinements are still the most favoured procedure in Holland.

New Zealand in its European population lost third place in 1959 to Norway, but on 1962 figures New Zealand is likely to have supplanted Norway in this position.

A very small country, Iceland, with 4,916 births and 64 infant deaths (1960 figures) has produced extraordinary low rates since 1956. However, the figures for this little country tend to fluctuate.

The following table contrasts the movement in the infant mortality rates for a selected group of countries which have white or part white populations over a forty year period.

TABLE 2 - INFANT MORTALITY RATES, 1921-62 - INTERNATIONAL COMPARISON

Number of deaths under one year per 1,000 liveborn

Country	1921-25	1926-30	1931-35	1936-40	1941-45	1946-50	1951-55	1956-60	1961-62
Netherlands	64	56	45	37	50	31	22	17	15
Sweden	60	58	50	42	31	24	19	17	15
Iceland	60	53	51	36	38	25	22	17	N.A
Norway	52	49	45	39	37	31	23	20	18*
New Zealand - European population	43	37	32	32	30	24	21	20	19
Australia	58	52	41	39	35	27	23	21	20
Finland	96	88	72	72	62	52	32	24	20
England and Wales	76	68	62	56	50	36	27	23	21
Denmark	82	82	71	60	49	37	27	23	21
Switzerland	65	54	48	45	40	36	29	23	21
United States of America - White population	71	65	54	48	38	30	25	23	22*
New Zealand - Total population	N.A	N.A	39	42	38	30	26	24	22
Czechoslovakia	155	140	125	108	113	88	49	29	23
France	95	89	73	70	81	59	43	32	26
South Africa - White population	73	67	63	53	46	36	32	30	28
Canada	98	93	75	64	55	44	35	30	28
Belgium	100	95	82	77	86	63	44	34	28
Japan	159	137	120	107	86	65	48	36	28
Italy	127	119	105	103	110	76	58	47	41

*1961 rate

Source: Demographic Yearbook, United Nations.
Epidemiological and Vital Statistics Reports, W.H.O.
Reports and Yearbooks for particular countries.

The effect of war on infant mortality, particularly in countries which became a battle-ground, is clearly discernible.

Whereas thirty years ago the inclusion of Maoris in the infant death rate for New Zealand increased it by seven to ten points the difference in 1961-62 between the total population rate and the European only rate was three points only. The trend in infant mortality over recent years in those countries with rates better than or close to those of the New Zealand Europeans are shown in the next table. In addition the crude birth rate in each of these countries is supplied for the latest year, 1962.

TABLE 3 - INFANT MORTALITY RATES, 1952-62 - TEN SELECTED COUNTRIES

Number of deaths under one year per 1,000 liveborn

Country	Infant mortality rate											Crude birth rate 1962 (per 1,000 pop.)
	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	
Netherlands	22.6	22.2	21.2	20.2	19.0	17.2	17.2	16.8	16.5	15.4	15.3	20.8
Sweden	20.0	18.7	18.7	17.4	17.3	17.8	15.9	16.6	16.6	15.5	15.3	14.2
New Zealand - European	21.8	20.1	20.0	20.1	19.4	20.0	19.4	19.9	19.7	19.1	18.0	24.8
Norway	23.7	22.0	21.4	20.6	21.2	20.5	20.0	18.7	18.9	17.9	N.A.	17.4
Finland	31.8	34.2	30.6	29.7	25.7	27.9	24.5	23.6	21.0	20.8	19.2	18.1
Denmark	28.9	27.2	26.9	25.2	24.9	23.4	22.4	22.5	21.5	21.8	20.1	16.7
Australia	23.8	23.3	22.5	22.0	21.7	21.4	20.5	21.5	20.2	19.5	20.4	22.1
Switzerland	29.1	29.8	27.2	26.5	25.8	22.9	22.2	22.2	21.1	21.0	21.2	18.7
England and Wales	27.5	26.8	25.4	24.9	23.7	23.1	22.5	22.2	21.9	21.4	21.4	18.0
United States of America - White population	25.5	25.0	23.9	23.6	23.2	23.3	23.8	23.2	22.9	22.4	N.A.	22.4

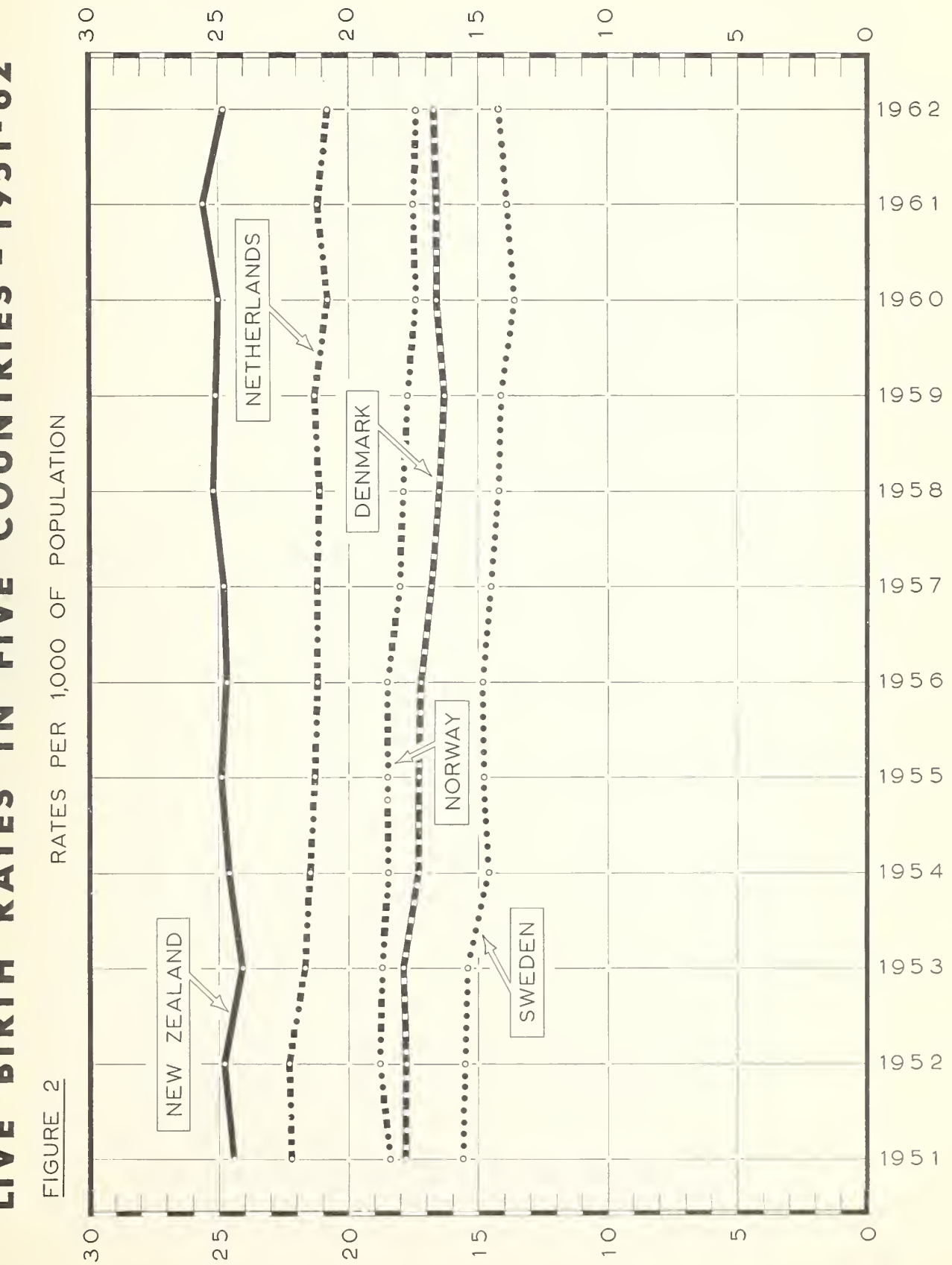
The Netherlands appears to have the lowest infant mortality rate in the world but there is every reason to think that the real honour is Sweden's. Premature babies of under 28 weeks gestation which breathe and which die within 3 days of birth are not always registered as live births and as infant deaths in Holland, it being left to the personal judgement of the doctor attending at the confinement as to whether the child could be considered to be viable or not. A viable child must by law be accorded a funeral and buried and there is clearly a temptation to avoid the bother. It is impossible to assess accurately the effect of these occurrences on the infant death rate but the understatement could be as much as 2 points. Confirmation of this would appear to be evident in the relatively high stillbirth rate in the Netherlands (14.8 in 1961) in comparison with the other Scandinavian countries and New Zealand (13.7 in 1961 for the European population).

The Netherlands remains the classical country of domiciliary confinement in that about 73 per cent of deliveries take place at home. It is significant that the proportion of hospital confinements continues to increase in the largest towns amounting to over 50 per cent.

A service peculiar to the Netherlands is the existence of the maternity home help who assists both at the confinement then remains with the mother and babe for the 10 following days. The assistance from the maternity aid would be of importance in the prevention of perinatal loss in that she takes care of the newborn from the moment of birth and protects it through the decisive first hours and days of life.

The Swedish definition of a live birth was up until 1960 confined to "breathing" whereas the international definition accepts also "any other evidence of life". It does not appear, however, that this change has had much influence as the 1961 and 1962 Swedish rates show quite a marked reduction on those for the preceding years. Some doubt exists, however, as to whether WHO definitions are strictly adhered to in the registration of infant deaths as the clergy of the State church responsible for burial act also as the registrars of births and deaths. The likelihood is that some very premature babies under 28 weeks gestation which show some evidence of life before death are not registered either as live births, infant deaths or stillbirths.

Live Birth Rates in Five Countries, 1951-62



Inset 5

Factors which must contribute to low Swedish infant death rates are the acceptance of legalised abortion and the very low birth rate (see Figure 2 on page 9). There can be little doubt that a high proportion of the risky cases would be removed by abortion, and birth control advice being freely availed of has resulted in better spacing of pregnancies in Sweden than in other countries (see Population Investigation Committee Report, London School of Economics).

Norway has the same parish registry system as Sweden which raises a doubt as to whether international definitions are adhered to as strictly as they are in New Zealand where there are no psychological and religious considerations. In addition there are wide regional differences in the infant mortality rates while in some areas up to 10 per cent of these deaths are uncertified - facts which throw some doubt on the reliance to be placed on the figures. Most births in Norway take place in hospitals but the percentage varies throughout the country from 94 per cent to 64 per cent.

Denmark appears to adhere strictly to the international definitions of both a live birth and a foetal death although some doubt must be expressed as to whether all foetal deaths are registered. A special certificate is provided for deaths of infants within the first 28 days of life. Confinements are divided evenly between those which take place in hospitals or clinics and those which take place in homes.

The table demonstrates the relatively small decline in both the New Zealand and American rates over the period in comparison with the more drastic reductions achieved by the other countries.

To obtain a truer contrast between New Zealand, Sweden, the Netherlands and Norway in infant loss it is necessary to examine them in the two age divisions of the first year of life. The analysis which follows is for the year 1960 and the rates are per 1,000 liveborn. The neonatal period is over the first 28 days of life and the post-neonatal period is over the remainder of the first year.

TABLE 4 - NEONATAL, POST-NEONATAL AND INFANT MORTALITY RATES, 1960
FOUR SELECTED COUNTRIES

	NEW ZEALAND	SWEDEN		THE NETHERLANDS		NORWAY	
			Advantage over N.Z.		Advantage over N.Z.		Advantage over N.Z.
Neonatal rate	14.48	13.82	0.66	12.07	2.41	11.68	2.80
Post-neonatal rate	5.18	2.80	2.38	4.46	0.72	7.18	*2.00
Infant rate	19.66	16.62	3.04	16.53	3.13	18.86	0.80

* New Zealand advantage over Norway

As between Sweden and the Netherlands the margin of advantage is seen to be almost exactly reversed in the neonatal and post-neonatal ages. Norway has the lowest recorded rate of neonatal loss of the four countries and the highest rate of post-neonatal loss.

Only the neonatal rate can be materially affected by differences in registration practices and definitions and it has been estimated that the Swedish neonatal rate would have been at least 1 point higher if the New Zealand criteria applied, while for the same reasons the Netherlands' neonatal rate would increase by about 1.3 points. The distinction of having the lowest neonatal rate probably belongs to Norway. However there must be some reservations about this because in post-neonatal loss the Norwegian rate of 7.18 is quite the most unfavourable in this comparison. Sweden it is which has the lowest post-neonatal rate in the world, and their figure of 2.80 is a most remarkable achievement being a 46 per cent improvement on that for New Zealand.

The New Zealand European crude birth rate (Maoris have close to twice the European rate) is one of the very highest of any white population in the world. Those few countries which show a lower rate of infant loss have also very much lower birth rates: furthermore the New Zealand birth figure tends to increase while there is a downward trend in the rates of those older more crowded European countries. Figure 2 contrasts the trends in the birth rates over the last ten years in the five large countries with the lowest infant mortality rates.

In summary two countries, the Netherlands and Sweden, undoubtedly produce lower total infant mortality rates than New Zealand but it is very probable that their advantage is less than is disclosed by the official figures. These two countries, along with Norway which leads with the lowest

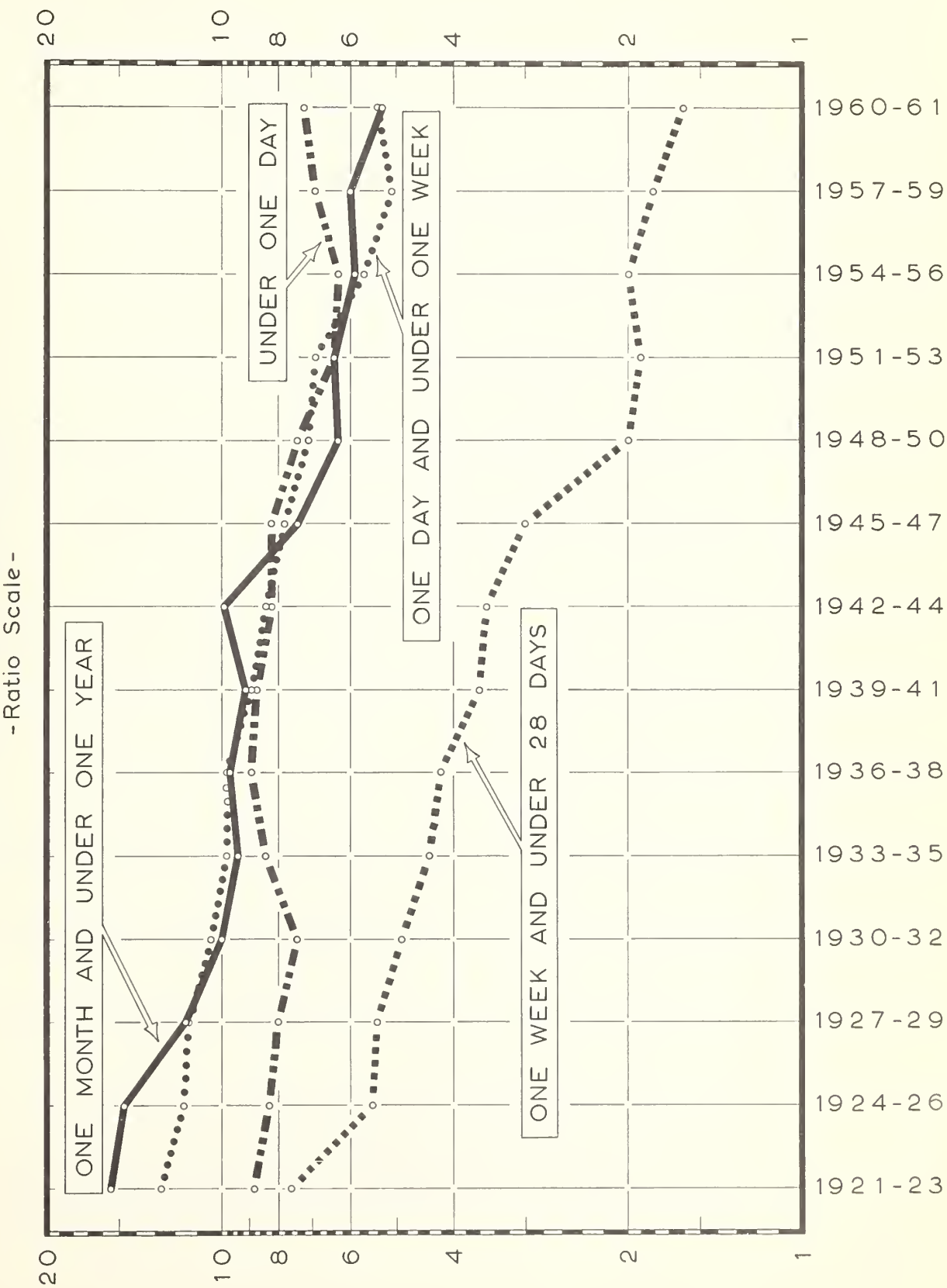
Infant Mortality Rates by Ages,
European 1921-62.

EUROPEAN INFANT MORTALITY RATES BY AGES 1921-61

FIGURE 3

RATES PER 1,000 LIVE BIRTHS

-Ratio Scale-



rate of neonatal loss, have highly skilled midwives and physicians plus a very efficient system of pre-natal care in a hardy race of very fine physique. Norway and Sweden both have very sterile winters with homes isolated. In consequence there is less risk of cross infection. In Norway and Sweden most births are in hospitals while the Netherlands still strongly favour home confinements although the proportion of these continues to drop. New Zealand has higher fertility with earlier and more frequent child-bearing which is further complicated by a strong demand for female labour due to over-full employment in a comparatively new country with an expanding economy.

2.3 European Infant Mortality - Rates in Age Divisions.

It has already been said that the closer to the moment of birth the greater risk of an infant dying, and there is considerable variation in the mortality within the first year of life.

Table A in the Appendix sets out the mortality rates at various age periods during the first year of life in each of the last forty one years, while the comparative movement in the rates is illustrated in Figure 3.

A summary of these rates in the eight quinquennia since 1922 is provided in the following table.

TABLE 5 - EUROPEAN INFANT MORTALITY, 1922-1962 - RATES BY AGE

Number of deaths at ages per 1,000 liveborn

Period	Early neonatal			Late neonatal	Total neonatal	Post-neonatal		
	Under one day	1 day & under 2 days	2 days & under 1 week	1 week & under 28 days	Under 28 days	28 days & under 6 months	6 months & under 12 months	Total infant mortality
1922-26	8.41	3.65	8.06	6.31	26.43	9.18	5.52	41.13
1927-31	7.87	3.56	7.57	5.26	24.26	6.81	4.09	35.16
1932-36	8.19	3.17	6.41	4.48	22.25	5.96	3.42	31.63
1937-41	8.71	2.75	6.63	3.85	21.94	5.97	3.54	31.45
1942-46	8.28	2.82	5.35	3.34	19.79	5.44	3.44	28.67
1947-51	7.42	2.96	4.36	1.99	16.73	4.16	2.37	23.26
1952-56	6.20	2.08	3.91	2.04	14.23	3.98	2.04	20.25
1957-61	7.01	2.04	3.16	1.71	13.92	3.77	1.91	19.60
1962	6.23	2.00	2.96	1.22	12.41	3.70	1.88	17.99
Percentage decrease 1922-26 - 1957-61	-16.6	-44.1	-60.8	-72.9	-47.3	-58.9	-65.4	-52.3

In 1962 sixty-nine per cent or close to two out of every three European infant deaths took place in the first month. More than one-third of all the deaths under 1 year of age now occur in the first day of life.

In the thirty-five year period between the first and the latest quinquennia 1922-26 and 1957-61, the total rate has been reduced by 52 per cent. The greater part of the saving has been effected in the post-neonatal ages rate which has dropped by close to two-thirds, rather than in the neonatal ages rate which has been less than halved.

The death-rate in the first day of life remained constant until the early post-war years since when there has been a slight decline. The reduction over 35 years of 17 per cent is the smallest at any age and must reflect improved obstetrical skill.

The rates for the second day of life have been almost halved; between 2 days and the first week a steady decline over the period amounts in all to a 61 per cent saving; a more spectacular fall is the reduction of 73 per cent at ages between 1 week and 1 month.

Improved nutrition and sanitation as well as important discoveries in medicine are reflected in the proportionate decline in deaths at ages 1-5 months and 6-11 months - 59 and 65 per cent respectively.

2.4 European Infant Mortality - Causes of Death

The following table provides a comparison over a fifty-year period of the death-rates in certain broad groups of diseases. Changes in classification prohibit a breakdown into specific disease titles.

To enable the comparison with past years to be maintained, the infant deaths for 1950 onwards have been reassembled to conform to that earlier classification - i.e., influenza deaths have been included under epidemic diseases, while both pneumonia and diarrhoea of the newborn have been included under respiratory and gastric and intestinal diseases respectively, and not as diseases of early infancy.

TABLE 6 - EUROPEAN INFANT MORTALITY RATES, 1902-62 - CAUSES OF DEATH

Rates per 1,000 liveborn

Period	Epi-demic diseases	Tuber-culosis	Infant-ile con-vulsions	Respir-atory diseases	Gastric & int-estinal diseases	Congen-ital malfor-mations	Diseases peculiar to early infancy	Other causes	Totals
1902-06	5.5	1.5	4.1	9.7	15.3	1.3	27.6	7.9	72.9
1907-11	5.9	1.3	3.3	7.6	15.5	1.9	26.7	6.3	68.5
1912-16	3.6	0.6	2.2	5.1	7.4	3.9	26.2	3.5	52.5
1917-21	3.2	0.5	1.9	4.7	4.5	4.3	26.1	2.9	48.1
1922-26	1.8	0.4	1.3	4.3	2.8	4.8	22.4	3.3	41.1
1927-31	1.5	0.3	0.5	3.7	1.7	5.0	19.4	3.1	35.2
1932-36	1.5	0.2	0.6	3.3	1.2	5.0	17.5	2.4	31.7
1937-41	1.4	0.2	0.2	3.1	1.3	5.5	17.4	2.5	31.6
1942-46	1.1	0.1	0.1	2.9	1.2	4.6	16.1	2.6	28.7
1947-51	0.6	0.1	0.1	2.3	0.8	3.8	13.6	2.0	23.3
1952-56	0.4	*	.	2.4	0.6	4.0	11.0	1.8	20.3
1957-61	0.3	*	.	2.1	0.6	3.9	10.7	1.9	19.6
1962	0.3	*	.	2.0	0.3	3.9	9.4	2.1	18.0

*Less than 0.1

In the quinquennium 1902-06 the combined rates of epidemic diseases, tuberculosis, convulsions, respiratory and gastro-intestinal diseases amounted to 36 in every thousand babies - one half of the total infant loss. In 1957-61 these diseases contributed only 3.0 per thousand - 15 per cent of the total. Expressed another way the campaigns against these diseases, combined with important medical advances, have resulted in a saving in recent years of 33 babies in every 1,000 born as compared with the early years of this century.

The largest single group contributor to the overall salvage of 53 infant lives in every thousand since the beginning of the present century has been in those conditions peculiar to early infancy. Included here are conditions such as immaturity, injuries at birth, post-natal asphyxia and infection, etc. The rates for these diseases remained high until after 1921 since when the reduction has been over 15 per thousand.

The steep drop over the half-century of close to 15 per thousand or 96 per cent in gastric and intestinal diseases reflects in large part the success in combating conditions which are caused by poor hygiene and faulty nourishment such as diarrhoea, gastro-enteritis and colitis.

The toll of respiratory diseases in infancy has declined steadily over the period by 78 per cent contributing over 7 per thousand to the total reduction. Discoveries in medicine in the way of antibacterial drugs have brought the death rate from acute respiratory infections down to very small figures.

Epidemic diseases no longer play an important role as a cause of death among infants. The control of secondary respiratory infection, together with the adoption of vaccination and immunization procedures and perhaps even changes in the virulence of organisms, have brought about a reduction of 94 per cent in epidemic disease mortality over the period. The chief killers of the past - whooping-cough, influenza, measles and diphtheria have almost disappeared from the scene, there being a total of only 6 European infant deaths from epidemic diseases in 1962 made up of meningococcal meningitis 2, whooping-cough 2, acute infectious encephalitis 1 and measles 1.

Neonatal Death Rates (Under 28 Days),
1931-62 - European and Maori.

NEONATAL DEATH RATES (UNDER 28 DAYS) 1931-62

EUROPEAN AND MAORI

RATES PER 1,000 LIVE BIRTHS

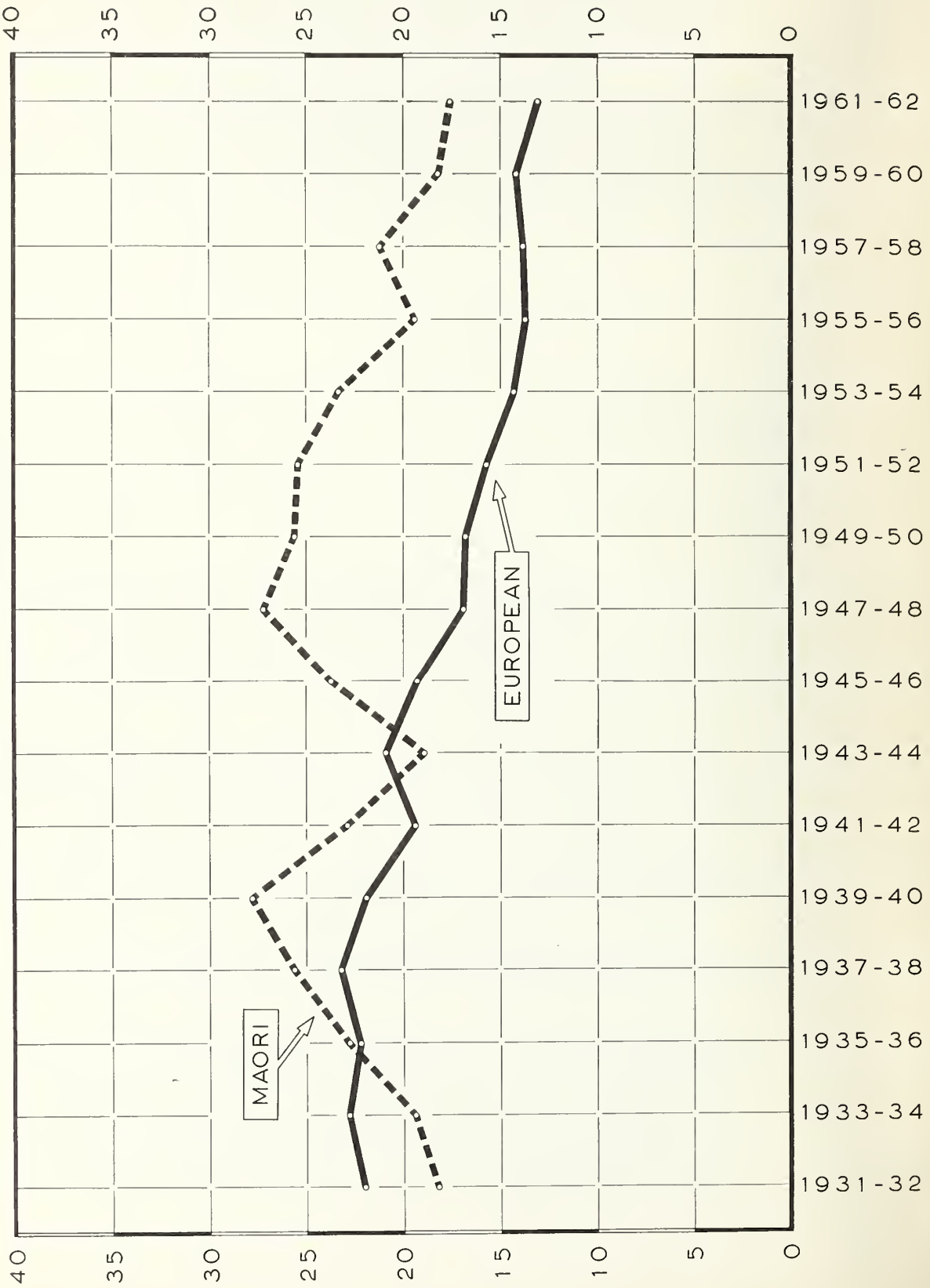


FIGURE 4

On the other hand there seem to be more deaths appearing from resistant strains of bacteria (streptococcus and staphylococcus) while obscure or undefined virus infections contributed 4 deaths to the total in 1962.

Tuberculosis has been almost eliminated as a cause of death in early infancy. The low figures shown for congenital malformations in the period 1902-11 are misleading in that they are due to a lack of knowledge concerning hydrocephalus, a condition which at that time was regarded as tuberculous. As a result the tuberculous figures are overstated in these earlier years and the increase in malformations is not a real one. Furthermore meningitis would undoubtedly be the underlying pathology of some of these deaths attributed to hydrocephalus.

The complete disappearance of convulsions as a cause of death is evidence of improvement in certification. In earlier years convulsions (often during the teething stage) were quite commonly returned as a cause of death whereas today the true underlying cause of the convulsions is returned on the certificate.

2.5 European Neonatal Mortality - Numbers and Rates

Up to and including the year 1949 the neonatal period covered the first calendar month of the infant's life. This period could of course vary between 28 and 31 days. In 1950 the World Health Organization defined the neonatal period as being within the first four weeks of early infancy.

Table A in the Appendix supplies a comparison of infant deaths in detailed ages both numbers and rates from 1921 to 1962 while Figure 4 on page 14 demonstrates the movement in the European neonatal rate over the period 1931-61. In subsection 2.3 there is a summary of the rates by certain ages both neonatal and post-neonatal in eight quinquennia (Table 4) and in the text the relative reduction in the age strata has been discussed.

An age sub-division of neonatal deaths in detail, both numbers and rates over the last five years is contained in Section 2.7 which follows.

The absolute numbers of neonatal deaths and the rates per 1,000 live births are shown for each sex separately and for both sexes combined over each of the last ten years in the following table:

TABLE 7 - EUROPEAN NEONATAL MORTALITY, 1953-62 - NUMBERS AND RATES BY SEX

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Males					
Numbers	395	415	422	394	428	435	422	452	477	424
Rates per 1,000 liveborn	16.58	16.62	16.44	15.15	16.13	15.72	15.03	15.88	16.14	14.42
					Females					
Numbers	268	279	283	279	290	296	340	351	318	289
Rates per 1,000 liveborn	11.86	11.89	11.69	11.43	11.46	11.34	12.75	13.01	11.30	10.30
					Both Sexes					
Numbers	663	694	705	673	718	731	762	803	795	713
Rates per 1,000 liveborn	14.28	14.33	14.14	13.35	13.85	13.59	13.92	14.49	13.78	12.41

There has been a very slight fall in the rates over the last ten years. The average rate of loss over the later five year period is 3 per cent less than the average rate over the first quinquennium.

A girl baby is endowed with superior vitality at birth and over the ten years surveyed male neonatal mortality exceeded female neonatal mortality by close to one third.

2.6 European Neonatal Mortality - International Comparison in Rates

The next table provides an international comparison of neonatal rates in a selected list of 15 countries which have rates approximating those of New Zealand. The rates are for the latest year for which figures are available.

TABLE 8 - NEONATAL MORTALITY RATES - INTERNATIONAL COMPARISON

Country	Year	Neonatal death rate (per 1,000 liveborn)
Netherlands	1962	11.1
Iceland	1960	11.5
Norway	1961	12.3
New Zealand (European population)	1962	12.4
New Zealand (total population)	1962	12.7
Sweden	1961	12.8
Czechoslovakia	1961	12.9
Australia	1962	14.7
England and Wales	1962	15.1
Japan	1962	15.3
Denmark	1961	16.5
France	1962	16.9
Italy	1960	17.1
Scotland	1962	17.9
Northern Ireland	1962	18.1
United States of America	1962	18.6
Ireland	1962	19.1
South Africa (White population)	1960	19.3
Federal Republic of Germany	1962	21.2

Source: Epidemiological and Vital Statistics Report, World Health Organisation.

The drop of over one point in New Zealand's neonatal rate in 1962 over 1961 has resulted in an improvement in international ranking. The inclusion of Maoris does not affect the ranking position and the New Zealand European and total population figures are only slightly higher than those of the Netherlands and Norway, although Sweden's 1962 rate has yet to be published.

Because of differences in registration practices and definitions (commented upon fully in subsection 2.2) there is reason to think that none of the three countries mentioned above have any real advantage over New Zealand. The high international ranking achieved by this country is all the more commendable because of the substantially higher level of parity as reflected in New Zealand's crude birth rate.

2.7 European Neonatal Mortality - Numbers and Rates at Detailed Ages

The following table sets out the absolute numbers and the rates per 1,000 liveborn at certain age intervals within the neonatal period in each of the last five years. Figure 3 on page 11 provides a graph of the rates since 1921 in three age strata - under 1 day, 1 day and under one week, 1 week and under one month.

TABLE 9 - EUROPEAN NEONATAL MORTALITY 1958-62 - NUMBERS AND RATES BY AGE

Year	Days							Weeks			Total under 28 days
	0	1-	2-	3-	4-	5-	6-	1-	2-	3-	
	Numbers										
1958	365	99	73	36	27	17	7	48	36	23	731
1959	387	98	76	50	22	15	15	52	27	20	762
1960	415	123	81	47	20	16	11	45	28	17	803
1961	396	119	79	46	23	24	16	55	23	14	795
1962	358	115	70	42	26	20	12	38	21	11	713
	Rates per 1000 Liveborn										
1958	6.79	1.84	1.36	0.67	0.50	0.32	0.13	0.89	0.67	0.43	13.59
1959	7.07	1.79	1.39	0.91	0.40	0.27	0.27	0.95	0.49	0.37	13.92
1960	7.49	2.22	1.46	0.85	0.36	0.29	0.20	0.81	0.51	0.31	14.49
1961	6.86	2.06	1.37	0.80	0.40	0.42	0.28	0.95	0.40	0.24	13.78
1962	6.23	2.00	1.22	0.73	0.45	0.35	0.21	0.66	0.37	0.19	12.41

Fifty per cent of deaths in the neonatal period take place within the first 24 hours of life while 16 per cent occur during the second day. Thereafter the numbers dying decrease as each day passes; the total of deaths in the last three-quarters of the neonatal period (between the 7th and the 28th day) contributes only 10 per cent to the total loss during the whole neonatal period of 28 days.

The 1962 rate of 12.41 per thousand live births is easily a record low for this country, the reduction over the 1961 figure being 1.37 per thousand or 10 per cent. The greatest percentage fall has taken place at ages between the first and fourth weeks but nevertheless, the reduction during the first 24 hours of life has also been substantial.

TABLE 10(a) - EUROPEAN NEONATAL MORTALITY - CAUSES OF DEATH - NUMBERS 1950-61

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual number of live births			45,143	48,238	52,019	55,960
			Average annual number of deaths			
Totals, all causes under 28 days			721	687	707	787
774-6	1	Immaturity	202	174	154	158
750-9	2	Congenital malformations	110	112	107	136
762	3	Post-natal asphyxia and atelectasis	150	125	142	131
760-1	4	Birth injury	131	125	131	127
772-3	5	Other and ill-defined diseases peculiar to early infancy	16	12	24	84
763-8	6	Infections of the newborn	26	35	46	37
770	7	Haemolytic disease (erythroblastosis)	39	39	37	36
769	8	Disorders arising from certain diseases of the mother during pregnancy	22	31	23	31
771	9	Haemorrhagic disease of the newborn	9	10	15	16
		Residuals				
Class I		Infective and parasitic diseases	1	2	2	1
" II		Neoplasms	1	1	1	1
" V		Mental disorders	1	2	1	4
" VI		Diseases of nervous system	2	5	5	5
" VIII		Diseases of respiratory system	2	2	0.5	-
" IX		Diseases of digestive system	5	7	12	13
" XVII		Accidental and violent causes	4	3	4	3
Remainder		All other (including causes unknown)	1	2	3	5

TABLE 10(b) - EUROPEAN NEONATAL MORTALITY - CAUSES OF DEATH - RATES PER 10,000 LIVEBORN

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual live birth rate			24.61	24.54	24.88	25.13
			Average annual rate per 10,000 liveborn			
Totals, all causes under 28 days			159.6	142.5	136.0	140.6
774-6	1	Immaturity	44.7	36.1	29.6	28.3
750-9	2	Congenital malformations	24.3	23.3	20.6	24.2
762	3	Post-natal asphyxia and atelectasis	33.2	25.8	27.3	23.4
760-1	4	Birth injury	29.1	25.9	25.2	22.7
772-3	5	Other and ill-defined diseases peculiar to early infancy	3.6	2.6	4.5	15.0
763-8	6	Infections of the newborn	5.7	7.3	8.8	6.7
770	7	Erythroblastosis	8.6	8.4	7.1	6.5
769	8	Disorders arising from certain diseases of the mother during pregnancy	4.8	6.4	4.4	5.5
771	9	Haemorrhagic disease of the newborn	2.1	2.0	2.9	2.8
		Residuals				
Class I		Infective and parasitic diseases	0.2	0.3	0.3	0.2
" II		Neoplasms	0.2	0.3	0.3	0.1
" V		Mental disorders	0.2	0.5	0.2	0.7
" VI		Diseases of nervous system	0.4	1.1	1.0	0.8
" VIII		Diseases of respiratory system	0.4	0.4	0.1	..
" IX		Diseases of digestive system	1.1	1.5	2.2	2.3
" XVII		Accidental and violent causes	0.8	0.6	0.8	0.5
Remainder		All other (including cause unknown)	0.3	0.3	0.6	0.8

2.8 European Neonatal Mortality - Causes of Death

Table 10 sets out in summary form the major causes of infant loss in New Zealand over the first 28 days of life. The absolute numbers as well as the rates per 10,000 liveborn have been included, the figures being averaged over four triennial periods since 1950.

The Sixth Revision of the International List adopted in 1950 was a radical change from the previous classification and largely invalidated comparisons by disease with all years prior to that date.

There are four major causes of neonatal mortality and these together account for about three-quarters of the total.

There is reason to believe that there have been some advances made in both prenatal and obstetrical care over the twelve year period which are reflected in the drop in the rates for immaturity and birth injury. There has been no appreciable change however in the malformation death rate. On the face of it there is a downward trend in the postnatal asphyxia rate but there has been a transference of some deaths (hyaline membrane disease) which formerly would have been included under this heading in the category of "other defined diseases peculiar to early infancy".

The rates in the minor diseases remained fairly stable with the exception of blood incompatibilities which show a slight but consistent downward trend.

Even in such a short space of time as twelve years true comparability between causes has been lost to some extent owing to the increased accuracy of certification resulting in transference of deaths between groups. For this reason it is essential to look closely at the movement in the figures recorded for each disease.

2.8.1 Immaturity

Immaturity is the leading direct cause of neonatal loss and as the maturity or otherwise of a babe at birth must determine in some degree its chances of survival, is commonly found associated with other leading conditions as an indirect cause of death. Because of the frequency with which immaturity appears both in a leading and in a subsidiary role, it is necessary to examine this factor in some detail. Quite obviously "immaturity" as a primary cause of death conceals some underlying pathology in the same way that "senility" does in the statistics of causes of death at the other extreme of the life span.

2.8.1.1 Immaturity as a primary cause of death

Babies with the very lowest birth weight usually have their deaths reported as being due to immaturity alone. As the birth weight increases and comes closer to the 5½lbs division there is an increased tendency to attribute the death to postnatal asphyxia or some other condition peculiar to early infancy.

Immaturity without further qualification has shown a declining trend as a primary cause of infant death. It is impossible to state precisely what part of this fall is real and what part represents more precision in certification by reason of more knowledge available to physicians in the way of increased availability of postmortem reports.

It is logical to assume that there has indeed been some appreciable reduction in the immaturity death rate through the extension of ante-natal services and improved techniques in handling the premature born infants.

Over the period covered in the table there has been an apparent reduction of over one-third in the immaturity rate. During each of the last three years 1959 to 1961 there has been a steady reduction in the rate of loss per 10,000 liveborn as follows - 1959, 31.2; 1960, 29.6; 1961, 24.3. The 1961 rate was the lowest which has ever been recorded for this condition in this country.

The problem of reducing the loss of infant life through premature birth can be divided into two parts. The first is to effect a fall in the incidence of premature delivery and this is mainly a social problem.

The second part is a medical problem and involves still further improvement in the standard of care of prematurely born babies. There are some well known causes of premature onset of labour such as multiple pregnancy (ten times more common in a multiple than in a single pregnancy), toxaemia and infection. In the majority of cases however there is no obvious explanation why the pregnancy did not carry on to term, but there are underlying factors which it is known can influence the occurrence of a premature birth such as insufficient prenatal care in early pregnancy, too close a spacing of pregnancies, poor maternal diet and heavy smoking in pregnancy, and below standard environmental and social conditions such as excessive work or worry during the later stages of pregnancy.

Much can be achieved in the way of salvage of infant life if the premature liveborn child can be kept alive for the first few critical days after birth.

2.8.1.2 Immaturity as an associated cause of death

The International Code of Causes of Death provides for a division of the diseases peculiar to early infancy into those where the babe was immature and those where it was not immature. This division provides very valuable information as to the prevalence of prematurity in neonatal deaths but up to recent years the coders were dependent on the fact of immaturity being recorded on the death certificate by the attending physician.

Commencing in the year 1952 some postmortem reports became available as a source of additional information and from that year onwards these were furnished to the statistician in increasing numbers until in the most recent years it can be said that in almost every case where an autopsy was carried out in a public hospital a copy of the report was furnished for statistical purposes.

A further source of information regarding immaturity is the birth notification form and by reference to this document the birth weights can be used to verify whether the babe was immature according to the weight criterion of 5½lbs or less at birth in all those cases where the fact that the babe was immature was not available from the death certificate. Table 11 sets out for each assigned cause those cases where the infant was immature and also the source of the information as to immaturity, i.e. whether obtained from the certificate or postmortem report or from the birthweight as supplied on the birth notification form. The figures cover the year 1960, the latest year for which this analysis was available.

TABLE 11 - EUROPEAN NEONATAL MORTALITY, 1960 - CAUSES AND INCIDENCE OF IMMATURITY

International List No.	Assigned cause of death	Total neonatal deaths	Deaths of babies born immature				
			Total born immature		Number with immaturity mentioned as an associated cause of death	Number born immature according to weight criterion	Deaths of babies not born immature
			Percentage with immaturity an associated cause	Number with immaturity an associated cause			
-	Totals	803	55.1	352	294	58	287
774-6	Immaturity, unqualified	164	..	..	..	..	..
760-1	Birth injury	151	57.6	87	74	13	64
750-9	Congenital malformation	136	27.9	38	17	21	98
762	Postnatal asphyxia and atelectasis	134	62.7	84	79	5	50
763-8	Infections of the newborn	35	42.9	15	13	2	20
770	Haemolytic disease (erythroblastosis)	29	65.5	19	12	7	10
769	Neonatal disorders arising from conditions in the mother	26	80.8	21	17	4	5
771	Haemorrhagic disease of newborn	13	46.2	6	6	..	7
772-3	Other and ill-defined diseases peculiar to early infancy	89	85.4	76	75	1	13
Residual	All other causes	26	23.1	6	1	5	20

This table serves to bring immaturity into its true perspective. In 164 cases immaturity was the assigned cause of death leaving 639 deaths classified to some other cause. Of these 639 deaths, 352 or 55.1 per cent were immature. The grand total of immature babies dying in the first month was 506 out of 803 neonatal deaths, a proportion of close to two out of every three.

These figures show that immaturity is of paramount importance in neonatal loss. Of the 89 deaths in 1960 classified to "other and ill-defined causes peculiar to early infancy", 55 were from a comparatively newly recognised disease entity, hyaline membrane disease, a lung condition frequently found in prematurely born infants.

Neonatal disorders arising from conditions in the mother which include toxaemia of pregnancy, maternal diabetes and maternal rubella, frequently end in the birth of an immature baby; two-thirds of the 29 deaths due to blood disorders were in immatures showing either that babies born in such circumstances tend to be immature or else the induction of premature labour to lessen the time of action of maternal antibodies introduces a new risk.

It is not surprising that close to two-thirds of babies dying from postnatal asphyxia were immature as this condition is always likely to crop up in feeble infants born before time.

Malformation of the developing foetus frequently results in a premature confinement and 38 or 28 per cent of the total of 136 malformation deaths were immature when delivered. It is interesting to note that in the presence of gross deformity the fact of immaturity is overshadowed as the figure of 21 deaths in this group which were not mentioned as being immature would indicate.

2.8.1.3 The incidence of immaturity in European births

As immaturity plays the leading role in neonatal mortality it is appropriate that the incidence of immaturity in New Zealand births be discussed.

In 1952 the regulations regarding notification of births were extended and from that date onwards the birthweight and period of gestation were required to be supplied on the notification of birth form.

The World Health Organisation has defined an immature infant as one with a birth-weight of 5½lbs. (2500 grams) or less at birth. If weight is not specified an infant with a gestation period of less than 37 weeks is considered as an equivalent of an immature infant. The reason for preferring a border-line on a weight basis rather than on a length of gestation basis is that the latter is liable to error and too often involves surmise whereas birth-weight is a physical measurement and is likely to be the more correct. There will of course be some cases where a baby would be premature on a weight basis and not so on a length of gestation basis. Twins are a common example of this. However, although the relationship between birth-weight and maturity is not clear-cut it is true in most cases that infants weighing less than 5½ lbs. require special care and attention.

The average weight of babies in 1961 with their standard deviations was as follows:-

	Average weight	Standard deviation
Single live births	7.60 lbs.	1.20 lbs.
Plural live births	5.62 lbs.	1.39 lbs.
Single stillborn births	5.85 lbs.	2.29 lbs.
Plural births with a still-born baby or babies	4.29 lbs.	-

The birth-weights of Maori babies are very slightly lower than those of Europeans. This is discussed in subsection 3.8 which follows.

The average weight at birth rises with parity. Figures taken out for a previous year showed that the average weight of a first-born child is about 7lbs.5ozs. whereas that of an average fourth or later baby rises to 7lbs.12ozs.

Table 12 on page 24 shows the distribution of births in 1961 according to the birth-weight. The totals of babies at weights above the dividing line can be defined as immature:-

TABLE 12 - EUROPEAN BIRTHS, 1961 - INCIDENCE OF IMMATURITY

Birth weight in pounds	Numbers						Percentages (of those weighed)					
	Liveborn		Stillborn		All births		Liveborn		Stillborn		All births	
	Single	Multiple	Single	Multiple	Single	Multiple	Single	Multiple	Single	Multiple	Single	Multiple
Under 2 lbs	76	28	31	3	107	31	0.1	2.1	4.5	8.1	0.2	2.3
2 & under 3 lbs	108	44	69	8	177	52	0.2	3.4	10.0	21.6	0.3	3.8
3 " " 4 "	249	72	75	5	324	77	0.5	5.5	10.8	13.5	0.6	5.7
4 " " 5 "	687	222	87	7	774	229	1.2	16.9	12.5	18.9	1.4	17.0
5 to 5½ lbs.	1,218	232	62	7	1,280	239	2.2	17.7	8.9	18.9	2.3	17.7
Over 5½ & under 6 lbs	1,863	200	22	1	1,885	201	3.3	15.2	3.2	2.7	3.3	14.9
6 & under 7 lbs	11,873	355	96	4	11,969	359	21.2	27.1	13.9	10.8	21.1	26.6
7 " " 8 lbs	20,475	126	125	2	20,600	128	36.6	9.6	18.0	5.4	36.4	9.5
8 " " 9 lbs	13,871	28	83	..	13,954	28	24.8	2.1	12.0	..	24.6	2.1
9 " " 10 lbs	4,575	5	23	..	4,598	5	8.2	0.4	3.3	..	8.1	0.4
10 lbs and over	919	..	20	..	939	..	1.7	..	2.9	..	1.7	..
Total weighed	55,914	1,312	693	37	56,607	1,349	100.0	100.0	100.0	100.0	100.0	100.0
Not weighed	435	45	63	9	498	54	...	..	..	..	..	..
Total births	56,349	1,357	756	46	57,105	1,403	..	..	..	..	..	..

Of the total of 57,956 babies born in 1961, 3,290 or a proportion of 5.7 per cent were immature according to the weight criterion. This proportion compares with the 1960 figure for white infants in the United States of America of 6.8 per cent and 5.04 per cent for Sweden in 1961.

The proportion immature in all single births was 4.8 per cent as against 46.5 per cent in multiple births (using a weight standard to measure immaturity) - a tenfold difference.

Confined to liveborn single cases the proportion immature was 4.2 per cent according to birth weight criterion. The comparative Maori proportion was higher at 5.8 per cent but this is probably an understatement of the true figure. The figure for Great Britain was established in 1946 as being 6.5 per cent.

The table demonstrates clearly the relationship between immaturity and the chance of a stillbirth. Of the 730 stillborn babies in 1961 no less than 354 or 48.5 per cent were immature. The proportion immature was much lower for single stillbirths (46.8 per cent) than for multiple stillbirths (81.0 per cent).

It is difficult to obtain figures covering all births in many other countries for purposes of comparison but there is reason to believe that New Zealand has a low immaturity rate. In any comparison between countries the influence of parity has to be taken into consideration.

2.8.2 Congenital malformations

The title covers defects and deformities established during foetal life and which were not caused by the birth process.

This group contributes on 1959-61 figures about 20 per cent to the total deaths in the neonatal period whereas in 1950-52 it contributed just over 15 per cent. The explanation is of course that the malformation rate has remained constant over the period whereas there has been a reduction in the rate of loss from remaining causes.

A wide range of organs and systems are involved as is illustrated in the following table covering the three years 1959 to 1961.

TABLE 13 - EUROPEAN NEONATAL MORTALITY, 1959-61 - TYPE OF CONGENITAL MALFORMATION

International List No.	Type of congenital malformation	Number of deaths during 1959-61 (three years)		
		Males	Females	Both sexes
750	Monstrosity	14	24	38
751	Spina bifida and meningocele	28	28	56
752	Hydrocephalus	12	8	20
753	Other parts of nervous system	3	7	10
754	Circulatory system	89	70	159
755	Cleft palate and hare lip	1	3	4
756	Digestive system	33	22	55
757	Genito-urinary system	15	9	24
758	Bone and joint	4	3	7
759	Other and unspecified sites	18	16	34
	Total	217	190	407

Thirty-nine per cent of the total malformation deaths in the neonatal period involved the cardiovascular system, 30 per cent were defects of the brain and spinal cord and 14 per cent were of digestive organs.

2.8.3 Postnatal asphyxia and atelectasis

This, the third leading cause of neonatal death, may be described as a deficiency in lung activity. These conditions are a special risk in weak premature babies.

Atelectasis in combination with oedema or haemorrhage is termed "pulmonary syndrome of the newborn". A condition known today as hyaline membrane disease frequently underlies these symptoms and its presence is revealed only by histological examination. Hyaline membrane disease is classified to "other and ill-defined diseases peculiar to early infancy" but in New Zealand a special sub-division has been created under this title so that the numbers certified as such are distinguishable. The effect has been that a proportion of what were formerly considered to be atelectasis cases have been transferred to hyaline membrane disease under another rubric.

The total number of deaths in which postmortem reports revealed the presence of hyaline membrane disease has increased over the years as follows:- 11 in 1958, 30 in 1959, 55 in 1960 and 66 in 1961. Quite obviously there have been large numbers of cases of hyaline membrane deaths in past years which have not been detected. The greater number of these would have been included as atelectasis deaths (others would have been included under immaturity and pneumonia of the newborn) and taking these transfers into consideration there is no indication that the death toll from postnatal asphyxia and atelectasis has declined over recent years.

2.8.4 Birth injury

The death toll from birth trauma approximates closely that of postnatal asphyxia and today contributes about one sixth of the neonatal total. Unlike postnatal asphyxia however there has been a significant fall of 22 per cent over the 1950-61 period, a result of improved skill at confinement and prenatal care. The 1961 figure of 19.2 deaths from birth injury per 10,000 liveborn is probably the lowest recorded up until that year in this country.

2.8.5 Other and ill-defined diseases peculiar to early infancy

Three categories of disease are covered by this title, two of which are defined categories. Nutritional maladjustment and hyaline membrane disease are the defined causes and a miscellaneous collection of ill-defined conditions such as inanition, respiratory failure, hepatitis, haemorrhage from the umbilicus etc. make up the ill-defined. In 1961 there were no deaths from nutritional maladjustment, 66 from hyaline membrane and 47 from the ill-defined causes. Of the 47 with ill-defined primary causes, 41 had immaturity as a subsidiary cause.

The number of deaths from ill-defined causes peculiar to early infancy has tended to rise in recent years, reflecting, by a contradiction in terms, an improvement in certification. This comes about through a shift from immaturity as a primary cause to immaturity as a cause associated with one of the ill-defined conditions mentioned.

The combination of the changes in the preceding paragraph with the recognition of the hyaline membrane condition invalidates comparisons between the first six years and the second six years in the table and explains the upward leap in the numbers during 1959-61.

2.8.6 Infections of the newborn

The group of postnatal infections in the form of pneumonia, diarrhoea, umbilical sepsis and other forms of generalized and localized infection are now the sixth leading cause of death in the first month. In 1961 the distribution of the total of 35 deaths was 25 for pneumonia, 2 for diarrhoea, 5 for umbilical sepsis and 3 for other sepsis of the newborn.

The group is responsible for under 5 per cent of the total deaths and there has been no movement of significance over the 12 year period.

The International List is not explicit as to whether some of the forms of infections which develop in the first four weeks of life should be included under the title "infections of the newborn". One example of this is generalized staphylococcal and streptococcal infections appearing later in the neonatal period. In 1956 and again in 1957 there were 2 deaths described as being due to staphylococcal septicaemia and in 1958 there were 4 such deaths.

Again localized skin infections such as acute abscess and cellulitis, probably having a source round and about the early days of life, occasionally do not develop until the second, third, or even fourth weeks, and it would appear appropriate to include such deaths also under the title of new-born infections.

It is apparent that conditions which are similar in nature can have different code numbers but in this compilation all such causes in the newborn child have been gathered under the general title "infections of the newborn".

2.8.7 Haemolytic disease (erythroblastosis)

Around 36 per year or just under 5 per cent of babies dying in the first month have died from this condition. There has been a slight but consistent saving of life over the last twelve years.

2.8.8 Disorders arising from certain diseases of the mother

In an average year some condition in the mother is responsible for about 30 or 4 per cent of the total neonatal loss. In 1961 the total was 28 deaths, 21 of which were attributed to "maternal toxaemia" (16 were immature), 2 were due to maternal diabetes while in the remaining 5 cases the maternal disease was not stated.

There has been little change in the rate over the period surveyed.

2.8.9 Haemorrhagic disease of newborn

There is a sharp drop in numbers between the eighth most important cause of neonatal mortality and the ninth which is spontaneous haemorrhagic conditions, developing mainly in the intestines. In 1961 there were 19 such deaths or 2.4 per cent of the total of which 8 were stated to be immature. The slight increase in the rates in more recent years can be attributed to better diagnosis.

2.8.10 Residuals

There has been a steady climb over the twelve year period in deaths from diseases of the digestive system in the first month. In 1961 there were 16 such deaths divided into 12 from congenital hernia, 1 from intussusception, 1 from acute atrophy of liver, 1 from cirrhosis of liver, and 1 from fibrocystic disease of the pancreas.

There were 6 neonatal deaths from external causes in 1961 of which 1 was from suffocation by vomit, 1 from neglect after birth, 1 from cold injury, 2 from therapeutic misadventure and 1 from homicidal injury.

2.9 European Neonatal Mortality - Comparison by Causes for Selected Countries

Four countries have been selected for a comparison by cause with the New Zealand figures. All four are countries in Europe and three of them - Sweden, the Netherlands and Norway - lead the world in low infant mortality while Denmark's level is only slightly higher than that of New Zealand.

Sub-section 2.2 ante compares the total infant death rates for the countries included in this neonatal comparison and describes customs and statistical practices which must account in some part for the differences in the rates for the various causes set down in the table which follows.

The following table covers figures for the years 1959-60 combined, the latest for which data are available. The figures for the three overseas countries have been supplied on request.

TABLE 14 - NEONATAL MORTALITY RATES, 1959-60 - CAUSES IN FIVE SELECTED COUNTRIES

International List No.	Cause of death	New Zealand	Netherlands	Norway	Sweden	Denmark
		Rates per 10,000 liveborn				
	All causes under 28 days	142.0	120.2	120.6	133.8	161.3
774-6	Immaturity	30.4	19.3	35.2	36.5	31.2
750-9	Congenital malformations	24.7	26.2	18.0	20.8	26.2
760-1	Birth injury	24.5	33.1	20.4	26.5	24.4
762	Postnatal asphyxia and atelectasis	23.2	12.8	20.4	32.0	45.8
772-3	Other and ill-defined diseases peculiar to early infancy	12.5	5.1	6.1	3.8	18.0
763-8	Infections of the newborn	7.0	6.8	6.0	3.5	3.8
770	Haemolytic disease (erythroblastosis)	6.4	4.2	2.8	2.1	4.5
769	Disorders arising from certain diseases of the mother during pregnancy	5.8	4.2	3.2	2.3	1.6
771	Haemorrhagic disease of the newborn	2.5	0.9	0.5	1.2	1.2
-	All other defined causes	4.7	4.8	3.1	5.1	4.0
-	Unspecified or ill-defined causes	0.3	2.8	4.9	..	0.6

Cause of death data are not available as yet for the years 1961 or 1962 but the latest published equivalent rates per 1,000 liveborn at the time of going to print were the Netherlands 11.1 (1962), Norway 12.3 (1961), New Zealand 12.4 (1962), Sweden 12.8 (1961) and Denmark 16.5 (1961) - all rates per 1,000 liveborn.

There is practically no difference in the lowest 1959-60 total rate of 120.2 for the Netherlands and 120.6 for Norway. With total rates so very similar it would be expected that the rates for all four principal causes of death at this age-period would approximate. Such is not the case, however, the figures cause by cause being irreconcilable and it is quite certain that either in the meaning of medical terms or in the reporting of causes of death, radical differences exist which invalidate the comparison between these two countries. The exclusion of liveborn infants under 28 weeks gestation from registration in the Netherlands has an obviously depreciatory effect on the immaturity and postnatal asphyxia rates.

It is interesting to contrast the New Zealand figures with those for both the Netherlands and Norway. In all official Netherlands statistical publications birth injury is combined with postnatal asphyxia and atelectasis. It would seem from this that there is some difference in the meaning attached to these terms in that country which would explain the very high death rate of 33.1 per 10,000 liveborn for birth injury (codes 760 and 761 in the International List) and some part of the corresponding very low death rate of 12.8 for postnatal asphyxia and atelectasis (code 762 in the International List). The New Zealand rates of 24.5 and 23.2 for birth injury and postnatal asphyxia on the other hand compare reasonably well with the Norwegian counterpart rates each of 20.4, all rates per 10,000 births. A low rate of loss from birth injury is usually attributable to the skill of doctors and midwives and to the physique of the mothers.

The low immaturity loss figure of 19.3 for the Netherlands (35.2 for Norway and 30.4 for New Zealand) is for reasons stated able to be explained in part at least; such a level would be remarkable in a country where over 70 per cent of confinements take place in residences whereas almost all New Zealand babies are delivered in hospitals. For death from congenital malformation the Netherlands rate is the highest of the three countries but very close to the New Zealand figure, whereas the Norwegian experience is remarkably low.

The proportion of deaths in the four leading categories to total deaths compares reasonably well in the three countries, Sweden, Denmark and New Zealand, although again Sweden has a restricted definition for a live birth. Of these three countries New Zealand has the lowest rate for immaturity unqualified and even more decisively the lowest for postnatal asphyxia and atelectasis. However Sweden records much the lowest figure for congenital malformation of these three countries while for some reason in birth injury the Swedish rate is the highest.

Combining all four of the principal disease causes in neonatal mortality gives an aggregate total of 102.8 for New Zealand, 115.8 for Sweden and 127.6 for Denmark. With much the lowest total for the four leading causes it would seem logical to expect that New Zealand would also possess the lowest total rate but such is not the case. The explanation is that in the remaining minor but precisely defined death categories the New Zealand rates are considerably higher than those for these other two countries with the exception of "other and ill-defined diseases peculiar to early infancy" in which group the Danish rate is much the highest. It is obvious that it is because of the disparity between the New Zealand and Swedish figures in these groups that the New Zealand total rate exceeds the Swedish total rate in the neonatal period. Now why should this be? It is difficult to accept the hypothesis that deaths from haemolytic disease of the newborn (erythroblastosis), neonatal disorders arising from maternal toxaemia, infections of the new born and certain other defined causes, are really so very much more prevalent in New Zealand than they are in Sweden and Denmark. Only in infections of the newborn could it be considered that a higher New Zealand incidence is a possibility. The most likely explanation is that the higher New Zealand rates in these minor disease categories are due to the availability of much greater detail (especially from pathology reports) which enables the cause of death to be established with precision. As a result deaths which in these and other countries would be assigned to say, postnatal asphyxia or immaturity, are in New Zealand more accurately classified to one of these less common defined causes.

The proportion of deaths unspecified or ill-defined as to cause was insignificant for both Sweden and New Zealand. The Netherlands show a percentage of 2.3 per cent ill-defined deaths while Norway has the highest percentage of unsatisfactory death recording at 4.1 per cent.

It is very obvious that it is regrettably not possible at present to establish in what cause or causes New Zealand loses a greater proportion of infants in the first 28 days of life in comparison with the two countries who lead in this field, the Netherlands and Norway. It seems from the discrepancies revealed in the table presented that it is not sufficient to have each country recording the facts of death on identical certificates and employing the same classification and system of selection of the cause of death. There appears to be a need for uniform criteria in the registration of an event as a live birth and an infant death, and for more direct consultation and precise agreement between the statistical authorities of the various nations of the world as to the exact meaning of medical terms, if true comparability is to be achieved in their tabulated results.

Post-Neonatal Death Rates (28 days and Under 1 Year), 1931-62- European and Maori.

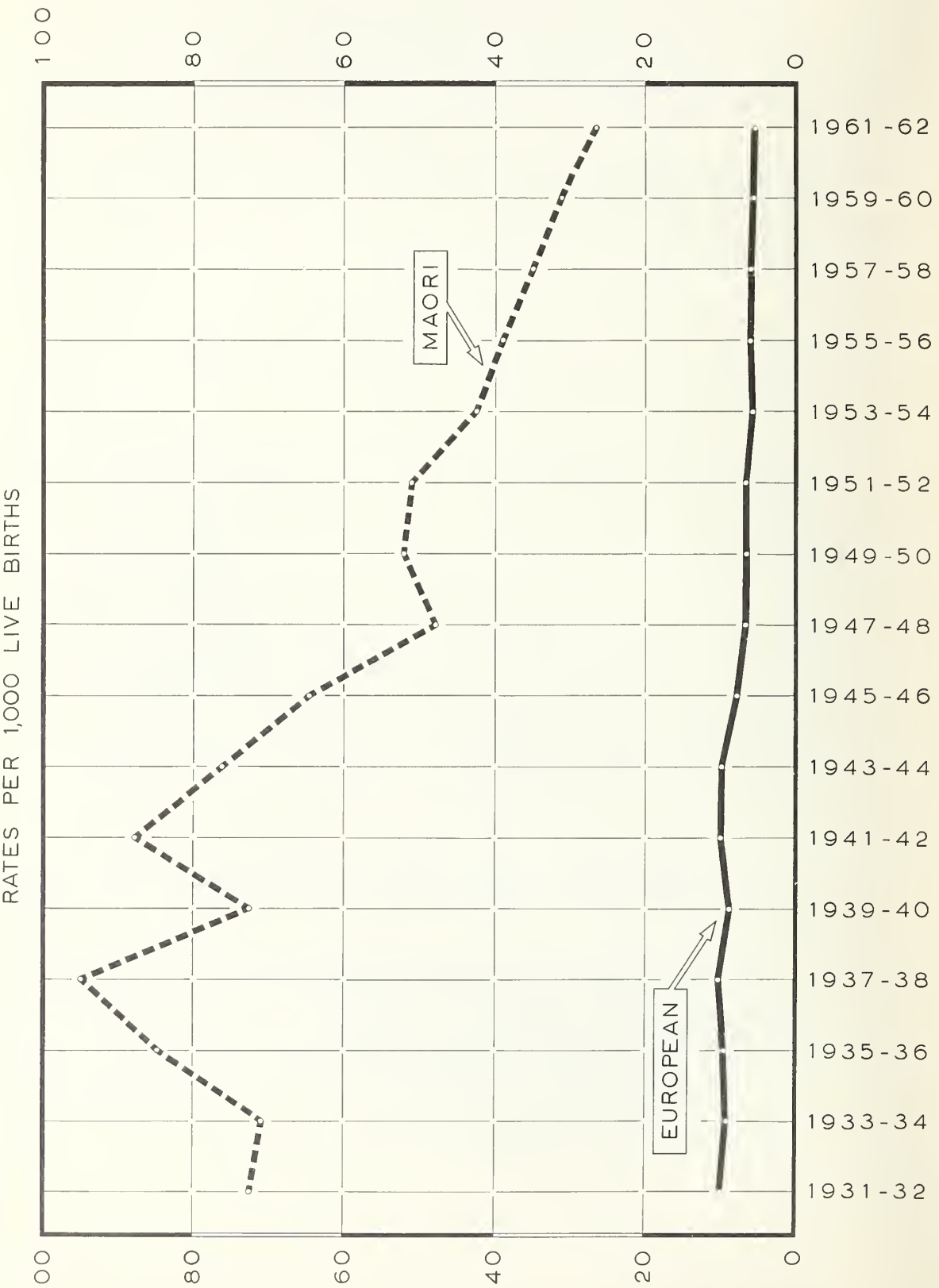


FIGURE 5

2.10 European Post-Neonatal Mortality - Numbers and Rates

While deaths in the first month of life are largely due to antenatal and obstetric factors, those occurring in the remaining eleven months of the first year reflect the adjustment of the infant to its environment, the principal causes of death being infections involving one system of the body or another.

Table A, Appendix, sets out the numbers and the rates of post-neonatal loss since 1921 while Figures 3 and 5 demonstrate the trend over the period 1931 to 1961.

TABLE 15 - EUROPEAN POST-NEONATAL MORTALITY 1953-62 - NUMBERS AND RATES BY SEX

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Males					
Numbers	154	141	177	148	177	173	187	160	178	186
Rates per 1,000 liveborn	6.46	5.65	6.90	5.69	6.67	6.25	6.66	5.62	6.02	6.33
					Females					
Numbers	114	133	120	157	141	139	140	127	131	135
Rates per 1,000 liveborn	5.05	5.67	4.96	6.43	5.57	5.33	5.25	4.71	4.65	4.81
					Both Sexes					
Numbers	268	274	297	305	318	312	327	287	309	321
Rates per 1,000 liveborn	5.77	5.66	5.96	6.05	6.13	5.80	5.97	5.18	5.35	5.59

As was seen in the rates in the neonatal period, male babies show a greater risk of dying at post-neonatal ages, the excess being to the extent of 17 per cent.

By far the greater part of the saving of infant life over the last half-century has been in post-neonatal deaths, the relative proportion of one-third neonatal to two-thirds post-neonatal which existed formerly being the reversal of the position today. There has been considerable fluctuation in the rates for the last ten years but as between 1953-57 and 1958-62 there has been a drop of 6 per cent. This is double the decline in neonatal deaths of 3 per cent over the same period.

2.11 European Post-Neonatal Mortality - International Comparison in Rates

The table which follows provides a comparison in post-neonatal rates in a selected group of countries.

TABLE 16 - POST-NEONATAL MORTALITY RATES - INTERNATIONAL COMPARISON

Country	Year	Post-neonatal rate (per 1,000 liveborn)
Sweden	1961	2.7
Iceland	1960	4.0
Netherlands	1962	4.2
Denmark	1961	5.3
Finland	1961	5.5
Norway	1961	5.6
New Zealand (European population)	1962	5.6
Australia	1962	5.7
England and Wales	1962	6.3
United States	1962	6.7
New Zealand (Total population)	1962	7.7
Scotland	1962	8.6
France	1962	9.0
Canada	1962	9.0
Belgium	1961	9.5
South Africa (White population)	1960	9.6
Czechoslovakia	1961	9.8
Japan	1962	11.2
Austria	1962	11.5
Italy	1960	21.4

New Zealand's position internationally is slightly less favourable in post-neonatal loss than it is at neonatal ages. Nevertheless, excluding Iceland which is a very small country with unreliable figures, only Sweden and the Netherlands produce rates which are significantly lower than the group of countries with rates about the 5 per thousand level - Denmark, Finland, Norway, Australia and the New Zealand European. New Zealand's rate when Maoris are included rises another two points reflecting the very unfavourable position in our small Maori population, their rate for 1962 being 23.7 or over four times that of the European figure.

Sweden's level in post-neonatal loss is most creditable. The advantage over other socially advanced nations must reflect the highest standards in all aspects of child welfare. Other contributory factors to Sweden's pre-eminent position must be the adoption of legal abortion in Sweden, better spacing of children and smaller families and less risk of cross infection in a very sterile winter climate.

2.12 European Post-Neonatal Mortality - Numbers and Rates at Detailed Ages

The absolute numbers and the rates per 1,000 births for the two sexes combined at different ages during the post-neonatal period of infant life are now given for each of the last 5 years in Table 17.

TABLE 17 - EUROPEAN POST-NEONATAL MORTALITY 1958-62 - NUMBERS AND RATES BY AGE

Year	28 days & under 2 months	2 months	3 months	4 months	5 months	6 months	7 months	8 months	9 months	10 months	11 months	Totals, 28 days & under 1 year
					Numbers							
1958	56	48	48	35	35	24	20	15	8	11	12	312
1959	55	44	46	32	34	37	16	20	16	16	11	327
1960	46	36	39	31	24	26	24	18	15	12	16	287
1961	52	44	44	41	35	19	17	13	15	18	11	309
1962	51	44	43	41	34	27	15	23	16	16	11	321
					Rates per 1,000 liveborn							
1958	1.04	0.89	0.89	0.65	0.65	0.45	0.37	0.28	0.15	0.21	0.22	5.80
1959	1.00	0.80	0.84	0.59	0.62	0.68	0.29	0.37	0.29	0.29	0.20	5.97
1960	0.83	0.65	0.70	0.56	0.43	0.47	0.43	0.33	0.27	0.22	0.29	5.18
1961	0.90	0.76	0.76	0.71	0.61	0.33	0.29	0.23	0.26	0.31	0.19	5.35
1962	0.89	0.77	0.75	0.71	0.59	0.47	0.26	0.40	0.28	0.28	0.19	5.59

The longer an infant in its first year lives beyond the first day of life the greater its chances of survival.

There is a slight declining trend apparent at most ages in the post-neonatal period of life.

TABLE 18(a) - EUROPEAN POST-NEONATAL MORTALITY, 1950-61 - CAUSES OF DEATH, NUMBERS

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual number of live births			45,143	48,238	52,019	55,960
			Average annual number of deaths			
Totals, all causes 28 days and under 1 year			292	280	312	308
750-9	1	Malformations	75	77	84	93
480-3) 490-3) 500-2)	2	Pneumonia, bronchitis and influenza	75	75	91	83
E860-E962	3	Accidents	26	20	27	24
040-096	4	Infections, bacterial and virus diseases	20	19	17	16
571	5	Gastro-enteritis and colitis	17	13	11	11
325,353	6	Mental deficiency and epilepsy	6	7	6	10
762-776	7	Diseases peculiar to early infancy	14	7	9	8
340	8	Meningitis (not meningococcal or tuberculous)	6	11	7	6
560-1, 570	8	Hernia, intestinal obstruction	8	2	7	6
390-8	8	Otitis media, mastoiditis, etc.	3	4	4	6
351	9	Cerebral spastic infantile paralysis	4	3	5	3
		Residuals				
Class I		Infective and parasitic diseases	2	2	1	2
" II		Neoplasms	2	2	4	5
" III		Allergic, endocrine system, etc.	3	3	4	2
" VI		Diseases of nervous system and sense organs	6	4	6	4
" VII		Diseases of the circulatory system	5	2	2	2
" VIII		Diseases of the respiratory system	6	11	11	12
" IX		Diseases of the digestive system	2	8	5	8
" X		Diseases of the genito-urinary system	4	5	2	3
" XII		Diseases of the skin and cellular tissue	2	2	5	2
" XIII		Diseases of the bones and organs of movement	1	1	2	1
-		All other causes	5	2	2	1

TABLE 18(b) - EUROPEAN POST-NEONATAL MORTALITY, 1950-61 - CAUSES OF DEATH, RATES PER 10,000 LIVEBORN

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual live birth rate			24.61	24.54	24.88	25.13
			Average annual rate per 10,000 liveborn			
Totals, all causes 28 days and under 1 year			64.8	58.0	59.9	55.0
750-9	1	Malformations	16.6	16.0	16.2	16.7
480-3) 490-3) 500-2)	2	Pneumonia, bronchitis and influenza	16.6	15.5	17.6	14.8
E860-E962	3	Accidents	5.8	4.1	5.2	4.3
040-096	4	Infections, bacterial and virus diseases	4.5	3.9	3.2	2.9
571	5	Gastro-enteritis and colitis	3.8	2.6	2.1	2.0
325,353	6	Mental deficiency and epilepsy .	1.3	1.4	1.2	1.8
762-776	7	Diseases peculiar to early infancy	3.2	1.4	1.7	1.4
340	8	Meningitis (not meningococcal or tuberculous)	1.3	2.3	1.4	1.1
560-1, 570	8	Hernia, intestinal obstruction	1.7	0.5	1.3	1.1
390-8	8	Otitis media, mastoiditis, etc.	0.5	0.9	0.8	1.1
351	9	Cerebral spastic infantile paralysis	0.9	0.7	0.9	0.5
		Residuals				
Class I		Infective and parastic diseases	0.4	0.4	0.2	0.3
" II		Neoplasms	0.4	0.5	0.8	0.8
" III		Allergic, endocrine system, etc.	0.7	0.6	0.7	0.4
" VI		Diseases of the nervous system and sense organs	1.3	0.8	1.2	0.7
" VII		Diseases of the circulatory system	1.2	0.5	0.4	0.3
" VIII		Diseases of the respiratory system	1.4	2.3	2.1	2.1
" IX		Diseases of the digestive system	0.5	1.7	0.9	1.4
" X		Diseases of the genito-urinary system	1.0	1.0	0.4	0.5
" XII		Diseases of the skin and cellular tissue	0.5	0.4	0.9	0.4
" XIII		Diseases of the bones and organs of movement	0.2	0.3	0.4	0.2
-		All other causes	1.0	0.5	0.4	0.2

2.13 European Post-Neonatal Mortality - Causes of Death

The causes of infant loss among European babies dying between the 28th day and before the end of the first year of life are set out in Table 18. The first half of the table shows the absolute numbers of deaths from each cause averaged over four triennial periods since 1950 and the second half shows the average rate of infant loss for every 1,000 infants born alive.

The two leading causes of death at these ages are congenital malformations and an aggregate group of respiratory diseases, pneumonia, bronchitis and influenza. These two commonest causes are together responsible for close to 60 per cent of the total post-neonatal loss.

2.13.1 Congenital malformations

The death rate from congenital malformations has shown no significant movement at all over the twelve year period. There were 280 post-neonatal deaths from the cause over the three years 1959 to 1961, distributed as follows between abnormalities in the various parts of the body. Refer to Table 13 subsection 2.8.2 ante for a similar anatomical breakdown of deaths during the neonatal period.

TABLE 19 - EUROPEAN POST-NEONATAL MORTALITY 1959-61 - TYPE OF CONGENITAL MALFORMATION

International List No.	Type of congenital malformation	Number of deaths during 1959-61 (three years)		
		Males	Females	Both sexes
750	Monstrosity	-	-	-
751	Spina bifida and meningocele	17	33	50
752	Hydrocephalus	10	9	19
753	Other parts of the nervous system	13	3	16
754	Circulatory system	76	75	151
755	Cleft palate and hare lip	1	2	3
756	Digestive system	16	6	22
757	Genito-urinary system	5	1	6
758	Bone and joint	4	-	4
759	Other and unspecified sites	7	2	9
	Totals	149	131	280

Over half of the deaths at post-neonatal ages were from deformities of the cardio-vascular system while close to one in three was due to a defect of the brain and central nervous system.

2.13.2 Pneumonia, bronchitis and influenza

Over one in every four of the total deaths in this age period is due to one or a combination of these respiratory diseases.

There has been a fall in the rate of loss from these diseases over the last three years. The 1957 world-wide epidemic of influenza is reflected in the rise in the rate which occurred over the 1956-58 period.

2.13.3 Accidents

There is a steep drop in numbers to this the third leading cause at these ages, contributing about 24 deaths or 8 per cent to the total. Each year there are about 12 deaths at post-neonatal ages from misadventure due to inhalation and ingestion of food while the second largest accidental cause is suffocation in bed, cot, bassinet or pram. Falls and motor-vehicle accidents each contribute 2 deaths in an average year.

2.13.4 Infectious, bacterial and virus diseases

This title covers all epidemic and transmittable diseases excepting tuberculosis and congenital syphilis. In the early colonisation period of New Zealand history epidemic diseases exacted a heavy toll of post-neonatal life. Through being diseases from which an infant could be protected a substantial reduction was able to be effected in these causes until the rate for the group became small relative to the remaining causes. However the fall in some other major causes has been steeper than that in communicable diseases and the effect has been to bring the infectious group of diseases back into prominence. Today over 5 per cent of post-neonatal deaths are due to a communicable disease.

The following are the principal epidemic disease deaths which contributed to the total of 28 deaths during the years 1959-61: meningococcal meningitis 6, chickenpox 6, measles 5, whooping cough 5, infectious encephalitis 3; non-epidemic infections made up a total of 21 deaths over this same period, 13 of which were from acute virus infections (many of a type not identifiable) and 5 from staphylococcus and streptococcus forms of septicaemia.

2.13.5 Gastro-enteritis and colitis

This, the fifth leading cause of death at post-neonatal ages, still claims about 11 deaths each year despite the advances in preventive and curative medicine. The death rate however has been almost halved in the twelve year period covered by the table.

2.13.6 Other conditions

Little improvement in the future can be expected in the rates for mental deficiency and epilepsy which are due to either genetic or pre-natal influences. There has apparently been some slight fall in the rates for some of the minor categories of disease while others have remained relatively stable over the twelve year period covered by the table.

2.14 European Post-Neonatal Mortality - Comparison in Causes for Selected Countries

The same four countries have supplied returns for a comparison in post-neonatal deaths in 1959-60 as did so for deaths in the first 28 days of life. The relative positions of these countries and New Zealand have altered in the subsequent years 1961 and 1962 with the result that only the Netherlands now holds an advantage over New Zealand in both broad age-divisions of the infant death-rate. Sweden still has a very much lower post-neonatal rate than New Zealand. While her level of neonatal loss is very much the same, Denmark also now shows a lower post-neonatal figure but her neonatal rate is the higher. Norway in 1961 showed rates very much the same as New Zealand in both age-divisions.

Table 20 shows post-neonatal rates by causes for the five countries averaged over the two years 1959 and 1960. Differences in registration practices and in criteria have little or no effect on events after the first month of life.

The lowest death rates for congenital malformations were those for Sweden and it is significant that in the neonatal group also Sweden showed an appreciably lower rate than New Zealand. For both age groups combined the Swedish total was 33.3 as against New Zealand's total figure of 41.5 per 10,000 births. Similarly the Netherland's malformation rates are slightly above New Zealand's in both age divisions.

It is in the group of respiratory infections, pneumonia, bronchitis and influenza that New Zealand figures compare so unfavourably with both Sweden and the Netherlands which have very similar rates. New Zealand's experience here is closer to that of Denmark and Norway.

In deaths from accidental causes New Zealand has the highest rate of all five countries.

The Swedish death rate from communicable disease is about one-quarter of that of New Zealand whose rate of loss approximates that of the Netherlands. In gastro-intestinal infections New Zealand has a very slight margin over Sweden but both these countries have not achieved the Netherland's level for this type of infection.

TABLE 20 - POST-NEONATAL MORTALITY RATES, 1959-60 - CAUSES IN FIVE SELECTED COUNTRIES

International List No.	Cause of death	New Zealand	Sweden	Netherlands	Norway	Denmark
		Rates per 10,000 liveborn				
	All causes, 28 days and under 1 year	55.7	32.4	46.4	67.1	58.5
750-9	Congenital malformations	16.8	12.5	17.0	14.3	18.7
480-502	Pneumonia, bronchitis and influenza	14.6	6.5	6.4	16.6	14.9
E800-E962	Accidents	4.3	1.9	2.9	3.3	3.3
040-096	Infectious, bacterial and virus diseases	3.3	0.8	3.6	3.9	2.1
762-776	Diseases peculiar to infancy	2.1	1.7	1.3	3.6	2.5
571	Gastro-enteritis and colitis	1.8	1.9	1.2	3.7	4.0
325,353	Mental deficiency	1.8	0.7	1.5	0.3	0.1
560-1, 570	Hernia, intestinal obstruction	1.2	1.0	0.9	1.2	0.8
390-8	Otitis media	1.1	0.1	1.3	1.0	0.8
340	Meningitis	1.1	0.5	0.6	2.0	0.8
351	Cerebral spastic infantile paralysis	0.3	0.4	0.6	1.2	0.7
	Residuals					
Class I	Infective and parasitic diseases	0.3	0.1	0.2	0.1	0.7
" II	Neoplasms	0.8	0.9	0.8	1.0	0.8
" III	Allergic, endocrine system, metabolic and nutritional diseases	0.2	0.4	0.6	1.0	-
" VI	Diseases of the nervous system and sense organs	0.7	0.6	0.7	1.6	0.7
" VII	Diseases of the circulatory system	0.3	0.1	0.4	-	0.2
" VIII	Diseases of the respiratory system	1.8	0.7	0.9	1.6	3.1
" IX	Diseases of the digestive system	1.5	0.7	0.9	1.0	0.4
" X	Diseases of the genito-urinary system	0.7	0.3	0.2	0.1	0.4
" XII	Diseases of the skin	0.5	0.1	0.3	0.2	0.1
" XIII	Diseases of the bones and organs of movement	0.3	0.1	0.4	0.5	0.2
	Other defined causes	0.1	0.4	0.2	0.1	0.4
	Ill-defined causes	0.1	-	3.5	8.8	2.8

With very few exceptions the New Zealand rates for the other main causes and for the residual groups were higher than the Swedish and the Netherlands equivalent. It does appear obvious that New Zealand babies who survive beyond the first month of life are very much more likely to die from an inflammatory or infectious condition than are babies in Sweden and the Netherlands.

The proportion of deaths at these ages in which the cause of death was not ascertained was insignificant in Sweden and New Zealand but in the remaining three countries, and more especially Norway, quite a proportion were ill-defined as to cause.

SECTION 3 - MAORI INFANT LOSS

The definition of a Maori for all population and vital statistic purposes is a person belonging to the aboriginal race of New Zealand, and includes a half-caste and a person intermediate in blood between half-castes and persons of pure Maori blood. Thus the deaths of infants who are part Maori but are nearer in blood to the European are included in the European figures in this report.

Separate registers, one for Maoris and one for all persons other than Maoris, were kept at each registration office up until the end of 1961. Under the Births and Deaths Registration Act, 1961, separate registers were abolished, and all entries have since been made in the same register. To distinguish Maoris from non-Maoris (loosely termed "Europeans") the degree of Maori blood was required to be entered in a special column in the register. The inception of the new system brought about some difficulty in the recording of the degree of Maori blood in a birth or in a death and it became apparent at the end of the year that many Maoris had not been registered as such. A check back on all entries has since been carried out and as a result the figures for 1962 match the generally falling trend in Maori rates although there is probably still some degree of understatement.

Throughout this section European numbers or rates are shown in juxtaposition with Maori numbers or rates so that the Maori infant loss is thrown into perspective.

3.1 Maori Births - Completeness of Registration

Birth registration figures form the denominator in the calculation of infant mortality rates and thus have special significance in a report of this nature.

The majority of Europeans are aware of the obligation to register each birth and of the advantages conferred by registration as a means of personal identification. In addition the European has always had an additional safeguard against failure to register in the compulsory notification of births. Thus European birth registration may be considered complete but with Maoris, in back years prior to 1940 particularly, the yearly birth figures cannot be accepted as a true indication of the number of births which occurred.

The year 1946 saw the introduction in New Zealand of family benefit payments in respect of each child under 16 years of age and there was a very marked upsurge in the number of Maori children registered during that year, for the reason that in order to qualify for the allowance it was necessary to produce a birth certificate. The number of births registered in 1946 was 5,847 an increase of 1,100 or 23 per cent over the total for 1945. A comparison by date of occurrence of the births registered in 1946 with those in years prior to that year showed conclusively that the increase was due to two factors - the late registration of births occurring in previous years and the prompt registration of births occurring in the year in question. In the following year 1947, the total of Maori births fell to a level in accordance with the trend in the years prior to 1946 and the rate per thousand of population has been steady in subsequent years.

The rush to register Maori births in 1946 in order to obtain the benefit for all children in the family had the effect of artificially reducing the infant mortality rate for that year. To obtain a truer picture, an estimate of the total of excess births registered in 1946 was made from a comparison with the 1945 registrations. The late registrations were then allocated back to the years in which they should have been registered. This of course raised the birth totals for these years and reduced the infant mortality rates. The amended birth totals and infant rates are contained in Appendix Table B.

From 1946 onwards the recorded yearly totals of Maori births registered can be taken as a fairly true measure of the births which have taken place. This improvement has not come about entirely through the availability of child benefits but also by the raising of Maori educational levels and the absorption of more Maori families into European communities. Separate Maori registers have now been abolished and the same regulations regarding the registration of vital events apply to all races.

There is still another important factor which makes for completeness of registration in Maoris and that is the proportion of Maori confinements which take place in a hospital. Up until 1961 there was no legal obligation for a Maori birth to be notified but hospital authorities generally had notwithstanding been in the habit of informing the district registrar of all births taking place within their institutions, irrespective of the race of the baby. The notification of a birth ensures that its registration does eventually take place.

Figures extracted for the year 1937 show that at that time only 17 per cent of Maori births took place in a hospital. By 1947 this proportion had risen to about 50 per cent of the total registered and each year since the percentage has risen. The figures for the most recent years and covering both live and still-births are set down below. These figures have been extracted from the Report on Vital Statistics issued by the Department of Statistics.

TABLE 21 - MAORI BIRTHS BY PLACE OF DELIVERY, 1960-62

Place of birth	1960		1961		1962	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Public hospital	6,625	88.4	6,977	88.6	7,189	92.4
Private hospital	232	3.1	220	2.8	230	3.0
Private residence	626	8.4	634	8.0	268	3.4
In an ambulance, car, boat, etc.	12	0.1	46	0.6	94	1.2
Total	7,495	100.0	7,877	100.0	7,781	100.0

The published figures over a long period of years have demonstrated a steady increase in the percentage of Maori mothers confined in a hospital. The 1962 figures showed a steep rise in this percentage from 91.4 in 1961 to 95.4 in 1962 while the proportion of home confinements dropped from 8.0 in 1961 to 3.4 per cent in 1962. Furthermore, the number and percentage of confinements taking place in ambulances, cars, boats, etc. doubled in the same period. The explanation of these abrupt movements in the figures lies in the greater accuracy in the reporting of place of birth as a result of the change in the law whereby every Maori birth registered from 1962 onwards was required to be notified by the person in charge of the hospital or home in which it occurred. This change has resulted in fuller information being available to the registrars than was the case previously and the 1962 proportions almost certainly reflect the true position. However, the proportion of 95.4 per cent of Maori births in hospital in 1962 is still well below the European figure of 99.3 per cent.

The indications are that there are very few Maori births occurring in private homes which escape registration. A still-birth occurring outside of a hospital would have the greatest probability of not being registered as a birth and it is interesting to compare the still-birth rates by place of confinement for the two years 1961 and 1962 combined.

TABLE 22 - MAORI STILLBIRTHS BY PLACE OF DELIVERY, 1961-62

Place of birth	Total Maori births	Total Maori stillbirths	Stillbirth rate (per 1,000 total births)
Public hospital	14,166	200	14.12
Private hospital	450	4	8.89
Private residence	902	14	15.52
In an ambulance, car, boat, etc.	140	6	42.86

The fact that the stillbirth rate for babies born outside of hospital is above that of children born within a hospital is some indication that if any Maori stillbirths do escape being registered then the number must be very small indeed.

Fertility Rates, 1923-62 - European and Maori.

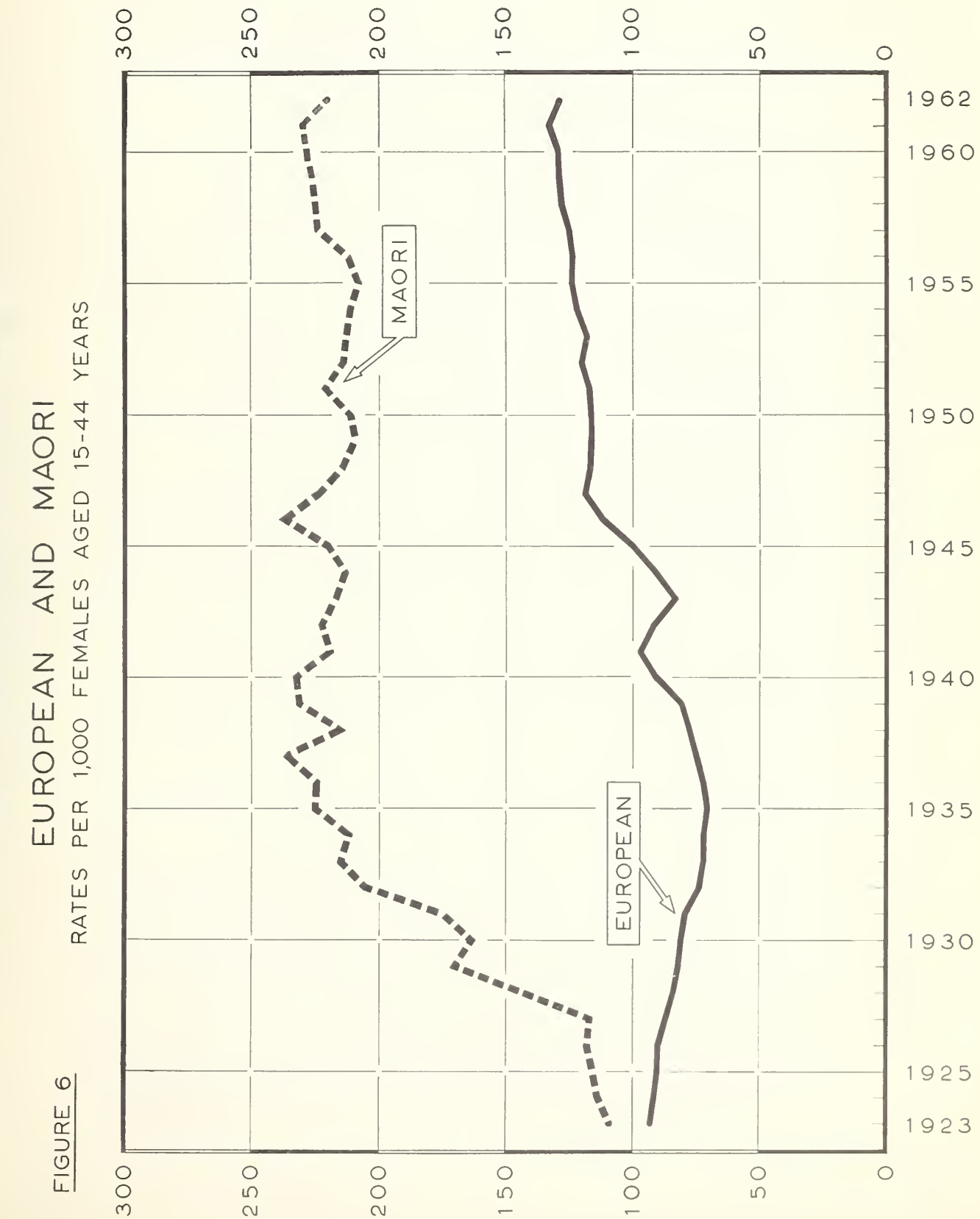


FIGURE 6

3.2 Maori Births - Fertility Rates

Study of international figures shows clearly how very high infant death rates go hand in hand with very high birth rates. This association is found in countries with low living standards, poor hygiene and inferior education. There is not an inevitable relationship between large families and death in early infancy but the connection is a strong one and has been shown to exist in white populations in other parts of the world, even when of equal social status. Various physical and psychological factors can be put forward to explain this correlation, but obvious ones are the health of the pregnant mother of high parity and short intervals between births resulting perhaps in obstetrical complication and a sickly baby, less care and attention given to the newborn infant, poor nutrition and increased risk of cross infection from siblings as well as economic hardship.

The New Zealand European birth rate of 25 per 1,000 has been shown in an earlier paragraph to be one of the highest of the world's white populations, and yet the Maori equivalent of 46 per thousand is close on double that figure. Higher birth rates than the Maori exist only in underdeveloped countries whose peoples have generally inferior social and economic standards to those of the Maori. It is certainly true that all these peoples with higher fertility have also much higher rates of infant loss than the Maori as well as much higher death rates at older ages.

It is the result of this combination of high fertility and only moderately high death rates at all ages that the close to 4 per cent yearly rate of population growth of the Maori ranks as perhaps the highest of any racial group in the world. The average annual percentage increase for the non-Maori population is very close to 2 per cent.

A comparison in graph form between the fertility of the Maori and the European calculated on the basis of each 1,000 women in the respective races at the reproductive ages between 15 and 45 years is contained in Figure 6 on page 43. It would have been preferable to use only the number of married women at these ages as a denominator and the number of legitimate children born as the numerator for the calculation of the fertility rates but there are obstacles to this. Firstly, population data by conjugal condition is available only at five yearly intervals from the census collection, and secondly it is still difficult to divide Maori births into those nuptial and those ex-nuptial owing to the frequency of marriages according to Maori custom in past years.

There is some of New Zealand history behind the fluctuations in the lines of this graph on page 43. While European fertility declined throughout the economic depression years of the twenties and thirties, reaching the lowest depth in the year 1935 with a rate of 70 per thousand, Maori fertility rose steeply throughout these years to the highest level of 236 in the year 1937. Some part of this Maori upsurge is due to improvement in birth registration but the greater part is a reflection of the revitalisation of the race under able leadership. With only minor movement due to the small numbers of births involved, Maori fertility showed no change whatsoever through the war and postwar eras, but in more recent years has again shown a rising trend, the rate of 230 in 1961 being the highest recorded in this period. There are however reasons to think that 1961 was the apogee, the latest year 1962 showing a decided drop in fertility which is being continued into 1963.

European fertility has been affected by a variety of circumstances since 1935 such as recovery from depression with an increase in the marriage rate boosted higher still by the outbreak of war. The later war years saw a rapid decline in the numbers of births but a recovery set in from 1944 to 1947 with the return of troops from overseas and the celebration of large numbers of postponed marriages. The European rate flattened out for a brief period, but since 1952 the trend has been consistently upward reaching a peak of 133 births per thousand women in 1961 - easily the highest recorded in the present century. Both 1962 and part 1963 figures indicate that a decline in these figures can be expected.

This phenomenon of high fertility is attributable to the period of continued prosperity which has resulted in earlier marriage with probably the highest proportion of married persons in the total population attained in New Zealand's history.

3.3 Maori Family Size

Maori women in general marry earlier than Europeans, have their first child at younger ages and bear a considerably larger number of children. A fairly high proportion of these children die in infancy and in childhood.

The differences in fertility between Maori and European women may perhaps be better understood by the use of figures which cover the child-bearing histories of married women whose families can be taken to have been completed.

The use of such figures means that only women past the reproductive ages can be included. In this case the age of 40 has been selected as the majority of women (but not all) would have by then ceased to bear children. Whatever age is selected the families of women who have died before reaching the age of 40 years would be omitted and undoubtedly some of these would have had very large families.

The following tabulation was extracted from information recorded in the course of three community health surveys in isolated rural Maori areas. The small population numbers necessitated the inclusion of all women 40 years and upward with no upper limit of age and a wide range of ages are covered. The disadvantage of this wide coverage is that the fertility of different generations of Maoris is involved, and each generation included might possibly have a slightly different level of fertility than the present day Maori woman who is still in the reproductive stage of her life.

The three communities covered were Te Karaka, Ruatahuna and Tikitiki and there might well be considerable difference between the figures for rural areas such as these and others taken out for semi-urban or urban domiciled Maori families.

TABLE 23 - MAORI FAMILY SIZE

Number of children (alive or dead) born to married women aged 40 and upward in three small Maori rural communities.

No. of children born	No. of mothers	No. of children born	No. of mothers	No. of children born	No. of mothers
0	10	7	9	14	7
1	7	8	6	15	5
2	12	9	10	16	6
3	9	10	16	17	4
4	7	11	8	18	3
5	5	12	19	19	3
6	8	13	5	Total married women	159

Questions asked by members of the survey team revealed that knowledge of birth control techniques was scanty, and the lack of pattern in the above table shows that under conditions of what can be only uncontrolled fertility there was considerable variation in the fecundity of individual persons. Undoubtedly, were very large numbers of families of the same type of Maori to be covered , some definite pattern of fecundity would emerge. The mean family size of the above distribution was 8.0 children and there is some evidence of a mode around ten, eleven, or twelve level.

Family planning is known to be widely practised by Europeans, and it is certain that a similar tabulation of children borne by European mothers would produce an assymmetrical distribution curve rising to a peak at 3 or 4 children and tailing off to very small figures at the higher end of the scale of numbers of children born. Dr. Ian Prior of the Medical Unit, Wellington Hospital, in his published paper covering a health survey says "some guidance and help with family planning is desirable and would be gratefully accepted by the majority of Maori mothers".

This attitude has been discovered to exist in other high fertility populations, many women with large families favouring small or smaller families, demonstrating that high fertility is largely the result of unplanned pregnancies.

3.4 Maori Infant Mortality - Numbers and Rates

The infant mortality loss for the Maori population has always been high in comparison with that of the European. However the gap between the rates for the two races has tended to narrow.

There is very much greater probability of a Maori baby dying before its first birthday than for a non-Maori baby. The chances of dying in the first year of life are 1 in 19 for Maori male babies (1 in 46 for the European) and 1 in 25 for Maori female babies (1 in 59 for the European), all on 1960-61 figures. The expectation of life increases for those Maori infants who survive to the first birthday by 3.07 years for a male baby and 2.12 for a female baby. (N.Z. Life Tables 1955-57).

About one quarter of New Zealand's infant mortality problem is the Maori problem. The totals of Maori and European infants lost over the last ten years together with the comparative rates of loss and percentage of Maori loss to total loss are shown in the following table.

TABLE 24 - MAORI AND EUROPEAN INFANT MORTALITY, 1953-62 - NUMBERS AND RATES

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Numbers					
Maori	404	334	363	335	384	373	388	330	386	297
European	931	968	1,002	978	1,036	1,043	1,089	1,090	1,104	1,034
Total population	1,335	1,302	1,365	1,313	1,420	1,416	1,477	1,420	1,490	1,331
Percentage of Maori deaths in total deaths	30.3	25.7	26.6	25.5	27.0	26.3	26.3	23.2	25.9	22.3
					Rates per 1,000 liveborn					
Maori	73.1	58.6	62.5	54.4	57.9	54.4	54.4	44.5	49.7	38.8
European	20.1	20.0	20.1	19.4	20.0	19.4	19.9	19.7	19.1	18.0
Total population	25.7	24.1	24.5	23.2	24.3	23.4	23.9	22.6	22.8	20.4

Figures taken out for each sex separately show that the male rate is in excess of the female rate to the same degree exactly in both races, there being in both Maori and European a 28 per cent higher mortality proportionately among males than among females.

The decline in the Maori rate of infant loss has been appreciable over the ten year period, the 1962 figure of 38.8 being the first time in recorded history below the level of 40 infant deaths per thousand liveborn. Comparing the averages in two quinquennia, 1953-57 and 1958-62, we find that the fall in the Maori figure is 21.1 per cent as opposed to a European drop of 3.5 per cent; in both races combined the reduction has been 8.7 per cent.

The infant mortality rates for each of the two races are contrasted in graph form in Figure I on page 6. Appendix Table A sets out the European numbers and rates from 1921 onwards, while Appendix Table B covers Maori figures back to 1930; the both races combined figures are contained in Appendix Table C.

3.5 Maori Infant Mortality - Neonatal, Post-Neonatal, and Total Rates

The following table shows the movement in the Maori rates at neonatal and post-neonatal ages since 1922 in eight quinquennia and also for the year 1962. Due to the Maori figures being so very small for the earlier years a more detailed age-breakdown as was done for the counterpart European table has not been undertaken.

There are three figures in this report which compare the trend in the rates in the Maori and in the European over thirty and forty year periods; total infant mortality is shown in Figure 1 on page 6, neonatal mortality is shown in Figure 4 on page 14, while post-neonatal trends in the two races are graphed in Figure 5 on page 30.

TABLE 25 - MAORI AND EUROPEAN INFANT MORTALITY, 1922-62 - NEONATAL, POST-NEONATAL AND TOTAL RATES

Period	Infant mortality (deaths under one year)		Neonatal mortality (deaths under 28 days)		Post-neonatal mortality (deaths 28 days and under one year)	
	Maori	European	Maori	European	Maori	European
1922-26*	131.0	41.1	26.7	26.4	104.3	14.7
1927-31	112.6	35.2	25.6	24.3	87.0	10.9
1932-36	98.1	31.6	21.3	22.2	76.8	9.4
1937-41	112.8	31.4	26.7	21.9	86.1	9.5
1942-46	92.7	28.7	21.0	19.8	71.7	8.9
1947-51	74.6	23.3	26.1	16.7	48.5	6.6
1952-56	66.2	20.2	22.2	14.2	44.0	6.0
1957-61	52.0	19.6	19.8	13.9	32.2	5.7
1962	38.8	18.0	15.0	12.4	23.7	5.6

* Maori figures for 1921-24.

Over the thirty-year period between the two quinquennia 1927-31 and 1957-61 the reductions have been, for neonates, Maori 23 per cent, European 43 per cent; for post-neonates, Maori 63 per cent, European 48 per cent; for all ages infant mortality, Maori 54 per cent, European 44 per cent. With greater scope for improvement the Maori record has been slightly the better.

3.6 Maori Neonatal Mortality - Numbers and Rates

The absolute numbers and the Maori neonatal rates with further age breakdown for each year since 1921 when such information first became available, are contained in Appendix Table B.

The previous section summarised the neonatal rates into eight quinquennia with an interpretation of the trend in the text.

The relative movement in the rates of both Maori and European are shown in graph form in Figure 4 on page 14. This diagram shows how the Maori neonatal rate, from being lower than the European rate in the early nineteen thirties, rose above the European rate, and after some erratic movement during the war years started on a fairly steady decline from 1947-48 onwards. However the European record is the better over the whole period covered.

In the table below Maori and European neonatal figures, both absolute numbers and rates, are contrasted over the last ten years. About one-sixth of the total loss of life at ages under 28 days in New Zealand is in the Maori.

TABLE 26 - MAORI AND EUROPEAN NEONATAL MORTALITY, 1953-62 - NUMBERS AND RATES

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Numbers					
Maori	148	114	109	123	135	151	137	128	157	115
European	663	694	705	673	718	731	762	803	795	713
Total population	811	808	814	796	853	882	899	931	952	828
Percentage of Maori deaths in total deaths	18.2	14.1	13.4	15.5	15.8	17.1	15.2	13.7	16.5	13.9
					Rates per 1,000 liveborn					
Maori	26.77	20.00	18.77	19.96	20.36	22.01	19.21	17.26	20.21	15.00
European	14.28	14.33	14.14	13.35	13.85	13.59	13.92	14.49	13.78	12.41
Total population	15.61	14.93	14.62	14.07	14.59	14.55	14.53	14.81	14.54	12.71
Ratio of European rate to Maori rate, 1 to	1.9	1.4	1.3	1.5	1.5	1.6	1.4	1.2	1.5	1.2

The Maori rate is about one-third as high again as the European rate at these ages.

There has been a very much more marked fall in the Maori rates over the period than in the European and the gap between the rates for the two races is narrowing. Whereas the Maori rates in the second half of the period averaged 11 per cent less than the rates in the first five years the European reduction was only 3 per cent.

3.7 Maori Infant Mortality - Numbers and Rates by Local Areas

There is considerable variation in Maori infant death rates when taken out according to Hospital Districts. Supplied in Appendix Table D is a statement setting down in both numbers and rates the Maori infant deaths registered over the five years 1957-61 allocated according to the domicile of the mother. The numbers of live births used in the calculation of the rates are those contained in the Vital Statistics Reports issued by the Department of Statistics, and these also are allocated to the place of domicile of the mother and not to the city, borough or county where the hospital in which the confinement took place was located.

The numbers and rates are divided into neonates (under 28 days), post-neonates (28 days to 1 year), and total infant loss (under 1 year).

The following is a summary of the figures set down in this Appendix.

TABLE 27 - MAORI INFANT MORTALITY BY DOMICILE, 1957-61 - NUMBERS AND RATES, TOTAL, NEONATAL, AND POST-NEONATAL

Domicile	Births	Number of deaths			Rates per 1,000 liveborn		
		Neonates (under 28 days)	Post-neonates (28 days & under 1 yr.	Infants (under 1 year)	Neonates (under 28 days)	Post-neonates (28 days & under 1 yr.	Infants (under 1 year)
Urban	6,831	155	162	317	22.7	23.7	46.4
Semi-urban	6,857	200	220	420	29.2	32.1	61.3
Rural	22,120	353	771	1,124	16.0	34.9	50.9
Total	35,808	708	1,153	1,861	19.8	32.2	52.0

In the above table urban covers population domiciled in the 15 main centres as defined prior to the 1961 census viz:- Auckland, Hamilton, Gisborne, Napier, Hastings, New Plymouth, Wanganui, Palmerston North, Hutt, Wellington, Nelson, Christchurch, Timaru, Dunedin, Invercargill. Semi-urban population is that in boroughs and dependent town districts, while rural population comprises that living in parts of counties and independent town districts not included under the first two headings.

Rural dwellers have the lowest Maori neonatal rate and the highest post-neonatal rate. The low neonatal rate is unexpected for these more isolated areas. The urban areas of Hamilton, Gisborne and Hastings had particularly high neonatal death rates whereas in Auckland, where almost half the total urban domiciled neonatal deaths occurred, the rate of 18.3 was below the New Zealand Maori overall average. The absolute numbers of Maori births and neonatal deaths were of course too small to permit comparisons between individual boroughs, but the figures for all semi-urban domiciled births showed a level significantly higher than the all New Zealand semi-urban average of 29.2 in the following Hospital Districts - Northland 35.0, Thames 64.5, Opotiki 40.4, Wairoa 47.9 and Wanganui 40.0. Because the totals of births and deaths were so often small the neonatal rates for the rural domiciled showed considerable fluctuation. The New Zealand rural figure was 16.2 and the following rates were recorded in those Hospital Districts with substantial rural Maori populations - Northland 21.1, Waikato 14.1, Tauranga 18.9, Bay of Plenty 16.3, Taumarunui 25.6, Waiapu 18.6, Cook 19.3 and Wairoa 20.6.

Post-neonatal rates are very much influenced by environmental conditions and as expected the highest rate of loss at these ages was among the back-block dwellers. However the city dwelling Maori still produces post-neonatal rates four times as high as the European, notwithstanding that both presumably enjoy the same advantages in regard to sanitation, water supply and other services including the availability of infant care advice. Auckland City, with about 60 per cent of the urban domiciled Maori post-neonatal loss, had a lower rate than Hamilton, Gisborne, Hastings and Wanganui but the lowest urban figure of all was that for Hutt-Wellington at 16.6 per 1,000 liveborn. In the semi-urban dwellers the following Hospital Districts which had reasonably large totals of Maori births produced rates well above the New Zealand Maori level of 32.1 - Northland 45.4, Thames 48.4 and Wanganui 47.5. Among the rural dwellers, significantly higher post-neonatal rates (the rural total rate was 35.4) showed up in the following Hospital Districts, Waikato 41.2, Thames 42.1, Bay of Plenty 52.2 and Wanganui 43.3 whereas Northland 30.1, Auckland 29.1, Cook 29.0 and Hawke's Bay 18.3 all showed to advantage in a between Maori comparison.

3.8 Maori Neonatal Mortality - Causes of Death

Table 28 presents in summary form the principal causes of death among Maori infants during the neonatal period in four triennial periods.

TABLE 28 - MAORI NEONATAL MORTALITY, 1950-61 - CAUSES OF DEATH, NUMBERS AND RATES

International List No.	Rank (1959-61 figures)	Cause of death	1950 - 52		1953 - 55		1956 - 58		1959 - 61	
			Average number of deaths each year	Rate per 10,000 liveborn*	Average number of deaths each year	Rate per 10,000 liveborn*	Average number of deaths each year	Rate per 10,000 liveborn*	Average number of deaths each year	Rate per 10,000 liveborn*
Average annual number of live births			5,267		5,679		6,552		7,438	
Totals, all causes under 28 days			139	263.9	124	217.8	136	208.1	141	189.1
774-6	1	Immaturity	45	85.4	40	69.8	34	51.9	32	43.0
760-1	2	Birth injury	25	47.5	27	47.5	32	49.4	29	39.0
762	3	Postnatal asphyxia	23	44.3	21	37.0	26	40.2	24	31.8
763-8	4	Infections of the newborn	9	17.7	9	15.3	13	19.9	15	19.7
750-9	5	Congenital malformations	11	20.9	11	19.4	13	19.3	14	18.4
772-3	6	Other and ill-defined diseases peculiar to early infancy	9	17.1	3	5.9	6	9.7	11	15.3
769	7	Disorders arising from diseases of mother	3	5.7	4	6.4	2	2.5	5	6.3
771	8	Haemorrhagic disease of the newborn	2	3.2	1	1.2	2	2.5	3	4.0
770	9	Erythroblastosis	4	7.6	3	4.7	1	1.0	1	1.8
Residual		Other defined causes	7	13.3	5	10.0	7	11.7	7	9.8
		Ill defined or not stated	1	1.2	-	0.6	-	-	-	-

* Rates calculated on absolute totals and not on average number of deaths.

In each of the three leading causes of death at these ages the 1959-61 figures show an improvement over those of the earlier triennia. The steepest fall is in immaturity, and part of the 50 per cent drop there may be due to improved reporting on the certificate of death which has resulted in the fact of immaturity being entered as an associated cause only. During 1959-61 there were 96 deaths of Maori babies under 28 days directly classified to immaturity but there were a further 110 deaths over the period where immaturity was stated on the certificate as an associated condition, making a total of 216 out of 422 where immaturity was a stated contributory factor. Death rates from both birth injury and postnatal asphyxia have dropped appreciably over the latest three-year period, while deaths from erythroblastosis have been exceedingly uncommon in the Maori.

The following table contrasts the Maori rates with the European rates in the leading causes of death over the last three years.

TABLE 29 - MAORI AND EUROPEAN NEONATAL MORTALITY, 1959-61 - CAUSES OF DEATH, AVERAGE ANNUAL RATES

International List No.	Rank (Total population figures)	Cause of death	Neonatal rates per 10,000 liveborn			Ratio of European rate to Maori rate 1 to -
			Maori	European	Total population	
Totals, all causes under 28 days			189	141	146	1.3
774-6	1	Immaturity	43	28	30	1.5
760-1	2	Birth injury	39	23	25	1.7
762	3	Postnatal asphyxia, atelectasis	32	23	24	1.4
750-9	4	Congenital malformations	18	24	23	0.8
772-3	5	Other and ill-defined diseases peculiar to early infancy	15	15	15	1.0
763-8	6	Infections of the newborn	20	7	8	2.9
770	7	Erythroblastosis	2	7	6	0.3
769	8	Disorders arising from diseases of the mother	6	6	6	1.0
771	9	Haemorrhagic disease of the newborn	4	3	3	1.3
Residual		Other defined causes	10	5	6	2.0

The Maori death rate from immaturity is half as high again as the European and it is difficult to escape the conclusion that the main factor behind this disparity would be much more frequent childbearing and the resultant conditions in the mother.

An analysis of the birth figures shows that whereas the average Maori baby weighs only slightly less than the average European baby there is quite a marked difference in the incidence of immaturity. The following is a comparison between the two races for the year 1961 but the real difference in both weight and percentage born immature is likely to be considerably more than is shown here, because while very few European babies are not weighed the large proportion of 18 per cent of Maori birth weights were not available in 1961. These Maori babies who are either not weighed or whose birth weights are not supplied are likely to include most of those who were born out of a hospital.

TABLE 30 - MAORI AND EUROPEAN BIRTHS, 1961 - AVERAGE BIRTH WEIGHT AND INCIDENCE OF IMMATURITY

	Single live births		Plural live births	
	Maori	European	Maori	European
Average birth weight (lbs)	7.40	7.60	5.69	5.62
Percentage immature according to weight criterion of $5\frac{1}{2}$ lbs or less	5.8	4.2	46.8	46.5

The difference in the rates for the two races is even wider for birth injury than it is for immaturity. As 95 per cent of Maori mothers are confined in hospitals the disparity may be explained by less adequate supervision during the ante-natal period as well as very much higher parity. Then again the effects of obesity so frequently found in young Maori women could be evidenced as in overweight mothers malpresentations present difficulties in diagnosis.

In post-natal asphyxia and atelectasis the Maori loss proportionately exceeds the European by a ratio of 1.4 to 1 and here again many of the same aetiological factors as have been put forward for the disparity in birth injury could be in part responsible.

The Maori congenital malformation rate is lower than that of the European.

In the rate for infections of the newborn which covers a number of similar conditions, the Maori death toll is relatively three times that of the European. This wide margin reflects the greater likelihood of the Maori infant contracting pneumonia or diarrhoea or acquiring sepsis in one form or another.

In the one condition only, erythroblastosis, was a Maori rate recorded below that of the European.

To sum up, the unfavourable Maori neonatal position calls for further case investigation and action directed towards a disclosure of the possible effects of some of the suggested causes such as type of physique, nutrition, excess weight and the reasons why many Maori mothers do not present themselves for examination at ante-natal clinics.

3.9 Maori Neonatal Mortality - Suspected Causal Factors

A special survey of Maori households in the Whangarei, Auckland, Hamilton, Gisborne and Palmerston North Health Districts was carried out in 1954 with the objective of obtaining a lead as to the factors which underlie high Maori infant mortality rates. The enquiry covered all infant deaths in a twelve-month period occurring in these areas. Also selected for comparative purposes were randomly collected samples of Maori babies and European babies who survived the first year of life.

The results of this survey with appropriate comment are contained in the introduction to the Annual Report on Medical Statistics, 1956. The tabulations show clearly how very different from the European is the mode of living and the general environment of the Maori.

In an attempt to establish how much influence the obvious differences have on the health of Maori infants, an analysis of the data as presented in the tables has been carried out, using the contrast in the two Maori groups only and discarding the European control group which was available. It is important to realise that this comparison is between two Maori groups and not between a Maori and a European group. There was in fact so very much difference in the Maori backblock way of living and that of the Europeans in the more closely settled areas that any factor at all was likely to show up as significant in an inter-racial comparison.

The chi-square test of independence has been employed, the object being to establish the degree of association of a number of factors both personal and in respect of dwellings with (a) the death and (b) the survival of a Maori infant. This test indicates whether a greater number of cases showing a given characteristic (e.g. artificial feeding) died or survived than could be expected by pure chance.

For example if 19 out of 20 artificially fed infants died while 19 out of 20 breast-fed infants survived the test would undoubtedly indicate a significant association between method of feeding and mortality. Nevertheless it cannot be concluded from this information alone that there is a direct causal relationship between the two variables. There were 45 Maori neonatal deaths in the sample and 196 Maori live babies in the control group. The results of the test were as follows:-

Variable	Chi-square	Significance
Mother's age	.08	*
Number of previous issue	3.35	*
Number of antenatal consultations	.06	*
Place of delivery	.02	*
Post-natal examination of mother by doctor	.16	*
Moves of household	.73	*
Chronic illness in household	4.96	S
Age of house	2.24	*
Rural location of household	.09	*
Number of occupants per bedroom	.39	*
Amount of floor space per person	3.61	*
Bath facilities	.87	*
Hot-water supply	1.70	*
Food storage	.11	*
Sanitation	.41	*
Curtilage	.15	*
Water supply	.16	*
Illness during pregnancy	11.21	S
Type of delivery	19.88	S
Mode of delivery	.31	*

S = Significant at the 5 per cent level of confidence or better.
* = Not significant.

A number of variables could not be tested for various reasons, chiefly inadequacy of the sample size.

One of the variables significantly associated with Maori neonatal mortality is the presence of chronic illness in the household. This however is not interpretable as easily as might be thought since this variable is not significant in the '28 days to one years' group of infants, and obviously very few neonates would be expected to die from contagious diseases. It may be related to maternal ill-health however. This is supported by the fact that "illness during pregnancy" and "type of delivery" are also significant. The lack of significance of the other variables is not unexpected since most of them would appear to apply to babies surviving the first 28 days of life. However, it might have been expected that "mother's age" and "number of previous issue" would be significant. "Mother's age" is clearly not so, thus confirming the results of a similar type of American survey.

Number of previous issue or parity is generally accepted as an important factor in neonatal mortality. In this study the chi-square value of 3.35 is very close to the conventional level of significance and it is very probable that in a further sample parity would be statistically established as a significant factor.

3.10 Maori Post-Neonatal Mortality - Numbers and Rates.

At no stage of life except perhaps in the vicinity of sixty years and upwards is the Maori subject to as great a risk of dying as between the ages of one month and the first birthday.

The excessively high Maori death toll at these ages (it is approaching four times that of the European) can largely be attributed to the less favourable environmental conditions in the way of substandard

housing, overcrowding and less attention to hygiene and to correct feeding methods. However underlying these visible factors there is without a doubt the greater racial vulnerability of the Maori baby in that it does not apparently possess the degree of immunity which has been acquired by the European over the centuries, nor has it the same ability to resist and throw off infections once contracted.

The absolute numbers and the rates for Maoris in each year since 1922 in two subdivisions of the post-neonatal period, 1 to 5 months and 6 to 11 months, are set down in Appendix B while subsection 3.5 ante summarises and discusses the trend in the rates over the last forty years. The graph on page 30 shows the relative movements in the post-neonatal rates for Maoris and Europeans since 1931.

A contrast between Maori and European in both numbers and rates over the last ten years follows:-

TABLE 31 - MAORI AND EUROPEAN POST-NEONATAL MORTALITY, 1953-62 - NUMBERS AND RATES

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
	Numbers									
Maori	256	220	254	212	249	222	251	202	229	182
European	268	274	297	305	318	312	327	287	309	321
Total population	524	494	551	517	567	534	578	489	538	503
Percentage of Maori deaths in total deaths	48.9	44.5	46.1	41.0	43.9	41.6	43.4	41.3	42.6	36.2
	Rates per 1,000 liveborn									
Maori	46.30	38.60	43.74	34.40	37.54	32.36	35.20	27.24	29.47	23.75
European	5.77	5.66	5.96	6.05	6.13	5.80	5.97	5.18	5.35	5.59
Total population	10.09	9.13	9.90	9.14	9.69	8.81	9.34	7.78	8.22	7.72
Ratio of European rate to Maori rate, 1 to	8.0	6.8	7.3	5.7	6.1	5.6	5.9	5.3	5.5	4.2

The 1962 Maori post-neonatal rate of 23.75 per thousand live-born is a low record which is most encouraging to all those concerned with Maori welfare. It becomes quite apparent that there has been much achieved in the reduction of Maori post-neonatal mortality over recent years. Although the proportion shows signs of dropping, close to four out of every ten babies who die in New Zealand at post-neonatal ages are Maori babies and the Maori rate is more than four times that of the European. However the gap in the figures for the two races is narrowing steadily as it is also doing at neonatal ages.

3.11 Maori Post-Neonatal Mortality - Causes of Death

Set down in summary form in the tables which follow are the principal causes of death among Maori post-neonatal infants grouped into four triennial periods. Table 32(a) shows the average annual numbers of death in each triennium and Table 32(b) contains the average annual rates per 10,000 liveborn in summarised causes of death.

TABLE 32(a) - MAORI POST-NEONATAL MORTALITY, 1950-61 - CAUSES OF DEATH, NUMBERS

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual number of live births			5,267	5,679	6,552	7,438
			Average annual number of deaths			
Totals, all causes 28 days and under 1 year			253	243	228	227
480-3) 490-3) 500-2)	1	Pneumonia, bronchitis and influenza	130	106	112	113
571	2	Gastro-enteritis and colitis	44	46	34	40
750-9	3	Malformations	9	9	16	18
340	4	Meningitis (not meningococcal or tuberculous)	9	7	8	10
040-096	5	Infections, bacterial and virus diseases (excepting tuberculosis)	13	19	12	10
E800-E962	6	Accidents	9	12	13	8
390-8	7	Otitis media, mastoiditis, etc.	5	5	4	5
760-776	8	Certain diseases peculiar to early infancy	11	7	5	2
001-019	9	Tuberculosis	6	5	3	2
		Residuals				
Class III		Allergic, endocrine system, and metabolic diseases	1	3	2	1
" IV		Diseases of the blood and blood-forming organs	1	2	2	-
" VI		Diseases of the nervous system and sense organs	2	4	4	4
" VII		Diseases of the circulatory system	1	3	1	1
" VIII		Diseases of the respiratory system	3	1	2	6
" IX		Diseases of the digestive system	3	5	4	3
" XII		Diseases of the skin and cellular tissue	3	3	4	2
		Other defined causes	1	3	2	2
		Ill-defined causes	2	3	-	-

TABLE 32(b) - MAORI POST-NEONATAL MORTALITY, 1950-61 - CAUSES OF DEATH, RATES PER 10,000 LIVEBORN

International List No.	Rank (1959-61 figures)	Cause of death	1950-52	1953-55	1956-58	1959-61
Average annual live birth rate			45.2	44.2	45.7	46.4
			Average annual rate per 10,000 liveborn			
Totals, all causes 28 days and under 1 year			479.1	428.5	347.5	305.6
480-3) 490-3) 500-2)	1	Pneumonia, bronchitis and influenza	246.2	187.8	171.0	151.5
571	2	Gastro-enteritis and colitis	84.2	82.2	52.4	53.3
750-9	3	Malformations	17.1	15.8	24.4	23.8
340	4	Meningitis (not meningoccoccal or tuberculous)	16.5	11.7	12.7	13.4
040-096	5	Infections, bacterial and virus diseases (excepting tuberculosis)	26.0	33.4	18.4	13.0
E800-E962	6	Accidents	17.7	21.1	19.8	11.2
390-8	7	Otitis media, mastoiditis etc.	8.9	9.4	6.6	7.2
762-776	8	Certain diseases peculiar to early infancy	21.5	11.7	7.6	3.1
001-019	9	Tuberculosis	11.4	9.4	5.1	2.7
		Residuals				
Class III		Allergic, endocrine system and metabolic diseases	1.9	4.7	2.0	1.4
" IV		Diseases of the blood and blood-forming organs	1.3	4.1	2.0	-
" VI		Diseases of the nervous system and sense organs	3.2	7.0	5.7	4.9
" VII		Diseases of the circulatory system	1.3	4.7	1.5	1.8
" VIII		Diseases of the respiratory system	5.1	1.8	2.0	7.6
" IX		Diseases of the digestive system	6.3	8.2	6.6	4.5
" XII		Diseases of the skin and cellular tissue	5.1	5.9	6.6	3.1
		Other defined causes	1.3	4.7	3.1	3.1
		Ill-defined causes	4.4	4.7	-	-

Almost the entire problem of reduction in post-neonatal Maori infant death is wrapped up in control over infections, two forms in particular, respiratory such as pneumonia, bronchitis and influenza and intestinal such as diarrhoea and enteritis, contributing two-thirds to the total loss at these ages. While there has unquestionably been significant progress made in the twelve year period, particularly in the case of respiratory infections, the proportion of the total deaths at these ages remains about the same.

Congenital malformations, the third leading cause, have shown no significant movement but there has been a substantial fall in the rate for simple meningitis. Epidemic and infectious conditions have dropped by half reflecting the reduction in deaths from whooping cough, measles, diphtheria, dysentery and acute infectious encephalitis, while tuberculosis has become infrequent. The greatest reduction in any group has been in those diseases peculiar to early infancy - principally nutritional maladjustment and diseases dating back to prenatal and natal causes such as post-natal asphyxia, immaturity and maternal toxaemia.

A comparison between Maori and European in the same causes as set out in the previous table follows in Table 33 for the last three years for which such information is available.

TABLE 33 - MAORI AND EUROPEAN POST-NEONATAL MORTALITY, 1959-61 - CAUSES OF DEATH, AVERAGE ANNUAL RATES

International List No.	Rank (Total population figures)	Cause of death	Post-neonatal rates per 10,000 liveborn			Ratio of European rate to Maori rate, 1 to -
			Maori	European	Total population	
Totals, all causes under 28 days			306	55	85	6
480-3) 490-3) 500-2)	1	Pneumonia, bronchitis and influenza	151	15	31	10
750-9	2	Malformations	24	17	18	1.4
571	3	Gastro-enteritis and colitis	53	2	8	26
E800-E962	4	Accidents	11	4	5	3
040-096	5	Infections, bacterial and virus diseases (excepting tuberculosis)	13	3	4	4
340	6	Meningitis (not meningoccocal or tuberculous)	13	1	2	13
390-8	7	Otitis media, mastoiditis, etc.	7	1	2	7
760-776	8	Diseases peculiar to early infancy	3	1	2	3
001-019	9	Tuberculosis	3	0.4	0.4	8
		Residuals				
Class III		Allergic, endocrine system, and metabolic diseases	1	0.4	0.5	2
" V		Mental diseases	2	2	2	1
" VI		Diseases of the nervous system and sense organs	4	1	1	4
" VII		Diseases of the circulatory system	2	0.3	0.5	7
" VIII		Diseases of the respiratory system	8	2	3	4
" IX		Diseases of the digestive system	5	3	3	2
" X		Diseases of the genito-urinary system	1	0.4	0.6	2
" XII		Diseases of the skin and cellular tissue	4	0.4	0.7	10
-		Other defined causes	1	1	1	1
-		Ill-defined causes	-	0.1	0.1	-

The loss of life in European children from the common types of respiratory infection such as pneumonia, bronchitis and influenza is 15 in every 10,000 at risk whereas 151 Maoris in every 10,000 born die from these causes - ten times as many. In actual numbers over the three years, 338 Maori babies have succumbed to respiratory disorders as against a total of 249 European babies, despite the fact there are 8 European infants in the population to every 1 Maori infant.

In diarrhoeal types of disease at post-neonatal ages the gap in the mortality rates as between the two races is even wider than in respiratory disorders, proportionately no less than 26 Maori babies dying to every 1 European. Talking again in absolute numbers this difference represents 119 Maori babies as against 34 European over the 1959-61 period.

The third leading Maori cause of death is congenital malformations and here again the Maori rate exceeds the European (in the under one month group the Maori rate was the lower).

The rate for accidental fatalities in Maori children in this age period is close to three times as high as the European. This would appear to indicate lower standards of care in both homes and in the community.

There is a very great discrepancy in the figures for the two races in the total of the group covering all infectious and bacterial diseases. Whooping-cough, meningoccocal meningitis and measles made up 20 out of the total of 29 Maori deaths under this heading during 1959-61, with another 4 deaths attributed to generalised septicaemia. The greatly increased death-toll from these types of infection can be attributed to the greater likelihood of a Maori baby being infected by older siblings in large families living under crowded conditions.

The very much higher Maori rates for meningitis, otitis media and for many diseases in the residual groups reflect in some measure the higher proportion of Maoris living in over-crowded or sub-standard conditions, with so very frequently a neglect to seek treatment for a comparatively minor antecedent infection.

3.12 Maori Post-Neonatal Mortality - Suspected Causal Factors

The same factor analysis of the tabulations made of the material collected during the 1954 Maori household survey as described in subsection 3.9 ante has been carried out for the post-neonatal ages. There were 97 Maori post-neonatal deaths and 196 Maori births who survived the first birthday in the respective groups compared.

Variable	Chi-square	Significance
Sanitation	5.69	S
Water supply	5.07	S
Rural location	3.84	S
Food storage	10.01	S
Curtilage	6.15	S
Hot-water supply	5.71	S
Frequency of consultations on infant care	7.40	S
Mother's age	.17	*
Number of previous issue	1.63	*
Number of antenatal consultations	.59	*
Number of occupants per bedroom	2.95	*
Amount of floor space per person	.45	*
Bath facilities	.16	*
Moves of household	1.09	*
Place of delivery	6.59	S
Age of house	.03	*
Artificial feeding	10.21	S
Post-natal examination of mother by doctor	1.39	*
Chronic illness in household	1.83	*

S = Significant at the 5 per cent level of confidence or better.
* = Not significant.

In the first seven variables a significantly higher proportion of the homes which were least satisfactory in regard to such amenities as drainage, sanitary facilities, water supply and general cleanliness were those which had housed a baby who had died.

Overcrowding (measured by number of occupants by number of rooms slept in) did not emerge as a significant factor in the chances of post-neonatal mortality. This was undoubtedly because there was very little difference in this respect between the two Maori groups. However the factor has undoubtedly an influence on Maori infant loss as has been shown in the high incidence of tuberculosis in the Maori, as well as the high toll of other infectious and contagious conditions which strike hard at Maori children at ages upward of the first birthday.

Unhygienic storage of foodstuffs and artificial feeding were two very highly significant factors and both are reflected no doubt in the undue prevalence of diarrhoeal disorders in the Maori infant. The survey showed 61 per cent of Maori infants who had died had been bottlefed as compared with 32 per cent in Maori births which had survived the first year and 18 per cent in the European sample. The percentage not breast fed for the two Maori groups combined was 44 per cent. This overall Maori-European disparity is hard to explain except that perhaps many of the Maori mothers in the sample could have weaned their babies early as they wished to take up jobs in factories, shearing sheds, market gardens, etc. Perhaps also the very common custom among Maoris of adopting out infants (mokopuna) to the care of grand parents might be a factor. Again field studies carried out by Dr. Ian Prior (1962) have shown clearly that all too many young Maori women are excessively overweight and English hospital studies (Graham Emerson, 1962) have indicated that lactation fails frequently in obese mothers.

The mothers of Maori infants who died in the post-neonatal period had had significantly less consultations with nurses in their homes than did those mothers of Maori babies who survived this dangerous period of life.

The importance of post-natal supervision as a factor is one which is difficult to measure statistically as it is the frail sickly baby which per se is likely to receive the greatest attention from visiting nurses, whereas this advice is not likely to be sought in the case of the thriving baby. In fact the highest proportion of mothers not visited at all was in the European group which would indicate perhaps that the perceptiveness of the mother is of prime importance.

Place of delivery was a significant factor also and in 1 in 4 Maori infant deaths in the sample the delivery had been in a private home or outside of hospital. Although Maori confinements (the proportion is now over 95 per cent) are now taking place in a hospital it does seem that there is a greater risk of losing a baby, even after the first month, when it is not delivered under ideal conditions. It could well be of course that there is a hidden social factor behind this evidence in that the more enlightened Maori mother it is who arranges to have her confinement in a hospital.

SECTION 4 - PERINATAL LOSS

This section of the report presents some data relating to perinatal deaths. A general discussion of this relatively new concept called perinatal mortality is contained in subsection 1.5 of the Introduction.

Perinatal mortality brings together into a single focus foetal deaths of 28 weeks or more gestation (stillbirths) and those deaths of liveborn infants which occur within the first 7 days of life. The perinatal death rate is expressed as the number of stillbirths and early neonatal deaths per 1,000 deliveries (stillbirths and live births combined).

The justification for combining foetal deaths (stillbirths) and deaths in the early part of extra-uterine life is that the majority of this infant loss is caused by the same ante-natal and natal influences which exist before the exogenous forces of wide variance make their influence felt. At later stages of infant life the relative importance of the prenatal and postnatal influences and their effect on mortality rates is completely reversed.

Over the years in New Zealand clearer definitions of live birth and foetal death (stillbirth) have been evolved and have been included in the law. In addition better prenatal care and obstetrics have resulted in more infants born alive who die soon after birth. Thus it is more accurate when considering trends in infant loss over a period of time to examine late foetal deaths (stillbirths) and first week deaths as a composite measure. Furthermore, the perinatal period minimises difficulties in comparisons betwen countries in which similar terms do not always mean similar things.

4.1 European and Maori Perinatal Mortality - Numbers and Rates, 1953-62

Set out in Appendix Table E are the absolute numbers of stillbirths and infant deaths under one week together with the respective rates, for each year since 1921 in the case of the European and from 1942 onwards for the Maori and total population. The following is a summary of these figures over the last ten years.

TABLE 34 - EUROPEAN AND MAORI PERINATAL MORTALITY, 1953-62 - NUMBERS AND RATES

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
					Numbers					
European	1,451	1,478	1,384	1,442	1,472	1,443	1,468	1,519	1,505	1,369
Maori	242	213	192	232	214	240	245	192	240	213
Total population	1,693	1,691	1,576	1,674	1,686	1,683	1,713	1,711	1,745	1,582
					Rates per 1,000 total births					
European	30.7	30.0	27.3	28.1	27.9	26.4	26.4	27.0	25.7	23.5
Maori	42.8	36.7	32.5	36.9	31.8	34.4	33.7	25.6	30.5	27.4
Total population	32.0	30.7	27.9	29.1	28.4	27.3	27.3	26.8	26.3	24.0

In 1962 there were 65,970 deliveries registered and 1,582 perinatal deaths. This means that today, about one in every forty-two deliveries ends either in the death of the foetus or of the newborn child before the first week has passed. The importance of perinatal wastage is seen in perspective when it is realised that the European figure of close to fourteen hundred babies each year is the total of all deaths from the end of the first week of life up to and including the 38th year.

There has been a steady reduction in the rate of perinatal wastage over the last ten years in both races. Comparing the first five years with the second five years, the Maori reduction has been the greater at 16 per cent as against 10 per cent in the European.

Allowing for a certain degree of under-registration in Maori stillbirths in earlier years (Maori figures have only been available since 1942) the stillbirth rates for the two races are reasonably approximate, the 1958-62 average rates being Maori 14.9 and European 14.0, each rate per 1,000 total births. Thus it is in the second component, first week infant deaths, that the Maori excess in perinatal mortality of 15 per cent over 1958-62 is largely to be found, the margin here being 24 per cent. The factors which are suspected as being responsible for the unfavourable Maori position lie probably in less ante-natal supervision in Maori mothers, poorer physique particularly in the way of excess weight, inferior diet in pregnancy, many more young primiparae and many more multiparae of older ages.

Table 35 supplies a summary of the trend in perinatal mortality in both races over the last forty years in the case of the European and over the last twenty years in the case of the Maori and the total population.

It is very apparent in an examination of the European figures that over the full forty-year period the fall in the stillbirth rate of over 50 per cent is greater than the fall in the early neonatal rate which has dropped 39 per cent. In the thirties there was no change in either component and it was not until the forties that there was any marked movement in either rate. Between 1952-56 and 1957-61 the European stillbirth rate dropped appreciably while in 1962 the record low level of 12.5 per thousand total births was reached, whereas the early neonatal rate showed comparatively little movement. The trend in the two components of the perinatal period together with the perinatal rate itself is shown in graph form in Figure 7 covering the European population from 1937 to 1962.

TABLE 35 - EUROPEAN AND MAORI STILLBIRTH, EARLY NEONATAL AND PERINATAL MORTALITY, 1922-62 - RATES

Period	EUROPEAN			MAORI			TOTAL POPULATION		
	Stillbirth rate (per 1000 total births)	Early neonatal rate (per 1000 live births)	Perinatal rate (per 1000 total births)	Stillbirth rate (per 1000 total births)	Early neonatal rate (per 1000 live births)	Perinatal rate (per 1000 total births)	Stillbirth rate (per 1000 total births)	Early neonatal rate (per 1000 live births)	Perinatal rate (per 1000 total births)
1922-26	29.7	20.1	49.2	*	*	*	*	*	*
1927-31	30.5	19.0	49.1	*	*	*	*	*	*
1932-36	26.7	17.8	42.7	*	*	*	*	*	*
1937-41	28.1	18.1	45.7	*	*	*	*	*	*
1942-46	23.8	16.4	39.9	16.9	13.4	30.5	23.0	16.1	38.8
1947-51	18.6	14.7	34.1	19.5	20.5	39.5	18.7	15.3	33.7
1952-56	17.3	12.2	29.3	19.2	19.0	37.9	17.5	12.9	30.2
1957-61	14.7	12.2	26.7	14.9	16.5	31.1	14.7	12.7	27.2
1962	12.5	11.2	23.5	15.0	12.6	27.4	12.8	11.3	24.0

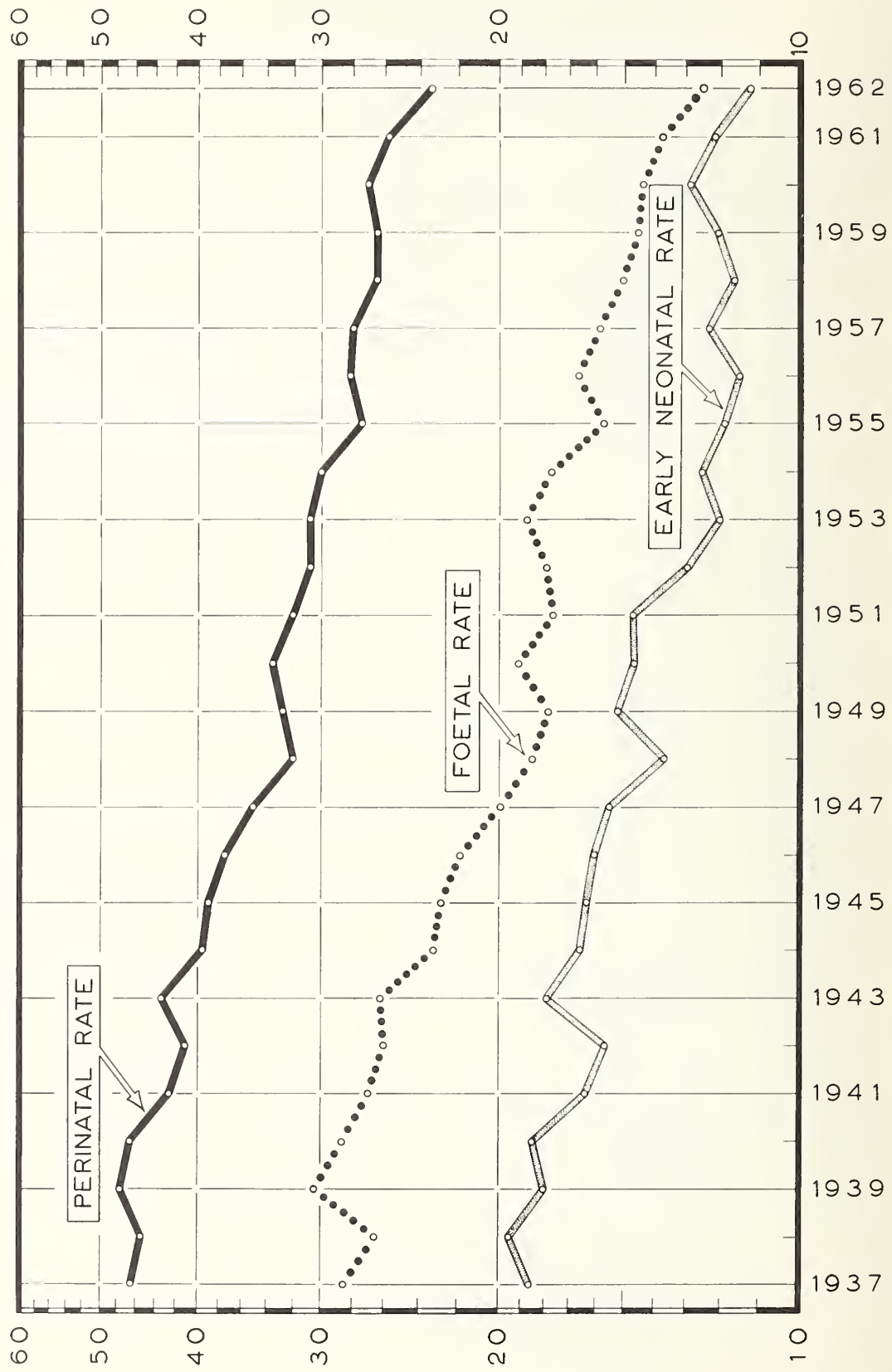
* Figures not available.

PERINATAL MORTALITY (EUROPEAN) - 1937-62

FIGURE 7

-RATIO SCALE-

PERINATAL AND FOETAL DEATH RATES PER 1,000 TOTAL BIRTHS
EARLY NEONATAL DEATH RATES PER 1,000 LIVE BIRTHS



4.2 Perinatal Mortality - International Comparison in Rates

The table which follows supplies an international comparison of perinatal rates in a selected list of countries. The figures are for 1961, the latest year for which such data are available, unless stated as being for an earlier year. The rates have been calculated on live births and not on total births (live births plus stillbirths) which is ideally the correct procedure.

TABLE 36 - PERINATAL MORTALITY RATES, 1961 - INTERNATIONAL COMPARISON

Country	Perinatal death rate (per 1,000 liveborn)
Czechoslovakia	20.2
Norway	23.5
Sweden	24.2
Netherlands	24.8
Finland (1960)	25.3
Switzerland (1960)	25.9
New Zealand (European population)	26.1
New Zealand (Total population)	26.7
Denmark	27.3
United States (1959)	27.6
Canada	28.5
France	30.3
Belgium	30.5
Austria	32.3
England and Wales	32.7
Hungary	34.0
Germany (Federal Republic)	34.8
Scotland	36.8
Japan	41.0
Italy (1960)	41.6
Portugal	45.6

Source: Epidemiological and Vital Statistics Report, Vol. 16, No. 10, 1963 published by the World Health Organisation.

TABLE 37 - PERINATAL, STILLBIRTH AND EARLY NEONATAL MORTALITY, 1961 - RATES IN FIVE SELECTED COUNTRIES

Rates per 1,000 live births

	New Zealand (European)	The Netherlands		Sweden		Norway		Denmark	
			Difference from N.Z. rate		Difference from N.Z. rate		Difference from N.Z. rate		Difference from N.Z. rate
Perinatal rate	26.1	24.8	-1.3	24.2	-1.9	23.5	-2.6	27.3	+1.2
Stillbirth rate	13.9	15.1	+1.2	12.8	-1.1	13.2	-0.7	12.7	-1.2
Early neonatal rate	12.2	9.7	-2.5	11.3	-0.9	10.3	-1.9	14.6	+2.4

Source: Epidemiological and Vital Statistics Report, Vol. 16, published by the World Health Organisation.

It has already been mentioned that stillbirth rates and early neonatal rates can be influenced in different countries by differences in definitions or in the interpretation of definitions as well as by registration practices. In this respect there is every reason to believe that the WHO definitions of both foetal death and live birth are closely adhered to in New Zealand by physicians, while the registration laws are strictly enforced.

There are six countries which on the face of it have lower perinatal rates than New Zealand. The very low figure for Czechoslovakia is due almost entirely to a remarkably low stillbirth rate while this same country had an infant mortality rate in 1962 which was 2 points higher than the New Zealand rate for the total population.

The New Zealand 1962 perinatal figure (based on a denominator of live births) was 23.8 for the European population. While Norway, Sweden, the Netherlands and Finland must also have improved on their 1961 rates, it is not likely that the reduction would be nearly so great in these countries.

Table 37 furnishes a more detailed comparison by setting out the components of the perinatal rate in 1961 for the three countries, the Netherlands, Sweden and Norway which lead the field in low rates of infant loss. One other Scandinavian country, Denmark, which has an infant death rate close to that of New Zealand, has also been included.

While Denmark has the lowest stillbirth rate of the five countries compared, this is compensated for by her having the highest neonatal rate. These two figures seem incompatible and some difference in the interpretation of the international definitions may well exist here.

New Zealand's stillbirth rate compares favourably with those of the Netherlands and Norway while there are explanations in the way of legalised abortion and low parity why Sweden can show such a low figure.

In the Netherlands a number of deaths of very immature liveborn infants are known to escape registration and it is very likely also that the same thing happens in the case of foetal deaths. The early neonatal rates of both Sweden and Norway may also be a slight understatement due to psychological and religious factors.

4.3 Perinatal Mortality - Causes of Death (European)

Causes of stillbirth are normally classified according to the International Classification of Causes of Stillbirth while early neonatal deaths are normally classified according to the International List of Causes of Death. Two entirely different types of certificate are employed for the reporting of causes of death in these two types of mortality and as a result, much information about maternal causes and complications of delivery which so often underlie the terminal cause of death in the newborn baby are not elicited. Until such time as a death certificate covering both stillbirth and early neonatal deaths is introduced and a combined classification of causes is applied, statistics of causes of perinatal loss will not provide a clear picture of the entire perinatal pathology.

The International Conference for the Seventh Revision of the International List of Diseases and Causes of Death recommended countries to undertake studies in respect of a combined classification of causes covering both stillbirths and early neonatal deaths. A Sub-committee appointed for this purpose by the United Nations National Committee on Vital and Health Statistics examined the problem and prepared successive drafts of a joint classification, which were revised on the basis of trial application to actual data. The new list of "Causes of Perinatal Morbidity and Mortality" is to become part of the International Classification of Diseases, 8th Revision.

Appendix Table F supplies a full tabulation of the 1961 European perinatal data classified according to the latest version of the integrated classification received, entitled "Certain Causes of Morbidity and Mortality Peculiar to Foetal and Early Infancy Periods". The following table summarises the material in this Appendix.

Maori perinatal material is not at present available for this form of analysis because not all certificates of causes of Maori stillbirths are forwarded to the district registrars.

TABLE 38 - EUROPEAN PERINATAL MORTALITY, 1961 - CAUSES OF DEATH

Code No.	Cause of death	Stillbirths (late foetal deaths)	Early neonatal deaths	Perinatal deaths	
				Number	Percentage of total
750-9	Congenital malformations	110	105	215	14.3
760-2	Mechanical birth injury	12	52	64	4.2
763	Difficulties of labour without mention of birth injury	44	-	44	2.9
764	Maternal hypertension and toxaemia	91	15	106	7.0
765	Maternal state during pregnancy or labour, excluding toxaemia	98	26	124	8.2
766	Placenta praevia, premature separation of placenta and prolapsed cord	82	17	99	6.6
767	Other conditions associated with asphyxia or hypoxia	132	42	174	11.5
768	Respiratory condition of newborn, excluding pneumonia	-	217	217	14.5
769	Infections acquired before or during birth	4	17	21	1.4
770	Haemolytic disease of the newborn (erythroblastosis)	50	34	84	5.6
771	Haemorrhage in foetus and newborn	5	21	26	1.7
772	Other specified disease	2	10	12	0.8
773	Immaturity, NOS or with ill-defined cause	40	139	179	11.9
774	Ill-defined cause	91	6	97	6.4
777	Unknown cause	41	1	42	2.9
778	External injury	-	1	1	0.1
	Total	802	703	1,505	100.0

The largest sub-group in the previous table is that (code 768) which covers respiratory conditions of the newborn, exclusive of pneumonia, principally atelectasis and hyaline membrane disease. These conditions, it has been shown, are very often associated with immaturity and foetal distress. Congenital malformation deaths (14 per cent of total) are evenly divided between those in the foetus and those in the newborn. Malformations of the brain and central nervous system are the principal sites affected although defects of the heart and gastro-intestinal tract contribute substantially. Large totals were recorded for diseases in the mother (codes 764 and 765) mainly toxaemia, diabetes and maternal haemorrhage, while causes which were foetal in origin (codes 766 and 767) made up 261 or a further 17 per cent of the total perinatal wastage. The specific complications in these sub-groups with high totals were placenta praevia, premature separation of placenta, cord conditions, maternal haemorrhage and difficult extraction. Some of these conditions very frequently have asphyxia in association. Immaturity is an unsatisfactory cause of foetal death, and the fact that 139 out of the total of 178 deaths assigned to immaturity NOS (code 773) were liveborn is indicative of the unsuitability of the present death certificate for reporting early neonatal deaths. Undoubtedly in many of these cases the early onset of labour would have been brought about by ante-natal or maternal conditions; or some complication of delivery would have been in the picture but had simply never been recorded for the reason that the certifying practitioner had limited the cause of death particulars to the relevant facts essential for registration purposes.

At the same time it must be emphasised that there will always be quite a substantial number of perinatal deaths in which the cause of death will be ill-defined or unknown.

Underlying even the most specific causes of infant death are the hidden influences which can sometimes be disclosed by an organised and searching study of hospital records supplemented by interview. Some information as to possible biological factors, such as younger or older mothers and short and long birth intervals, is obtainable from birth registers; but other details such as history of previous foetal loss and a possible history of habitual abortion must be obtained elsewhere. More difficult still it is to examine covariables such as economic level and educational status of the mother, diet during pregnancy, the mother's psychological or domestic problems and the extent of her ante-natal care.

REFERENCES

Vital Statistics Report of New Zealand, 1961.

Medical Statistics Report of New Zealand (Introductory), 1956.

Epidemiological and Vital Statistics Report, Volume 15, No. 9, 1962, World Health Organisation.

Demographic Yearbook 1961, United Nations.

Emerson, R.G. Obesity and Its Association with the Complications of Pregnancy, British Medical J., August 1962.

Prior, Ian. A Health Survey in a Rural Maori Community, N.Z. Medical Journal, July, 1962.

Population Investigation Committee Report, London School of Economics.

ACKNOWLEDGMENTS

My grateful thanks are due to the following:-

Dr. B.J. Mackay, Assistant Director of the Division of Public Health (Maternal and Child Health), both for her interest in this report and for her contribution in making valuable criticisms and helpful suggestions.

Miss F. Davidson, Nutrition Officer, Department of Health, a member of the survey team investigating Maori Health, who supplied figures of Maori family size as well as contributing general information about the factors which, it is suspected, contribute to the high rates of infant loss in the Maori.

Mr. R.G. Melville, draftsman in the Department of Statistics, for the excellent figures.

APPENDIX TABLE A - EUROPEAN INFANT MORTALITY - NUMBERS AND RATES BY AGE - 1921-1962

Year	Number of Live births	Under 1 day		1 day & under 2 days		2 days & under 1 wk		1 wk & under 28 days		28 days and under 6 months		6 months and under 12 months		All Ages Infant Mortality	
		Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births
1921	28,567	259	9.1	126	4.4	276	9.7	215	7.5	332	11.6	158	5.5	1,366	47.8
1922	29,006	254	8.8	113	3.9	225	7.8	198	6.7	274	9.5	151	5.2	1,215	41.9
1923	27,967	236	8.4	110	3.9	231	8.3	234	8.4	267	9.6	145	5.2	1,225*	43.8
1924	28,014	221	7.9	94	3.4	210	7.5	146	5.2	280	9.9	176	6.3	1,127	40.2
1925	28,153	235	8.3	99	3.5	237	8.4	173	6.2	245	8.8	136	4.8	1,125	40.0
1926	28,473	244	8.6	101	3.5	238	8.4	142	5.0	234	8.2	173	6.1	1,132	39.8
1927	27,881	224	8.0	101	3.6	215	7.7	180	6.5	227	8.1	133	4.8	1,080	38.7
1928	27,200	230	8.5	101	3.7	224	8.2	137	5.0	189	7.0	103	3.8	984	36.2
1929	26,747	197	7.4	90	3.4	205	7.7	130	4.8	178	6.6	112	4.2	912	34.1
1930	26,799	224	8.4	88	3.3	200	7.4	132	4.9	182	6.8	98	3.7	924	34.5
1931	26,622	190	7.1	101	3.8	180	6.8	133	5.0	145	5.5	107	4.0	856	32.2
1932	24,884	164	6.6	87	3.5	158	6.3	121	4.9	151	6.1	96	3.8	777	31.2
1933	24,334	195	8.0	70	2.9	170	7.0	120	4.9	150	6.1	65	2.7	770	31.6
1934	24,322	221	9.1	82	3.4	153	6.3	100	4.1	141	5.8	84	3.4	781	32.1
1935	23,965	196	8.2	72	3.0	161	6.7	99	4.1	160	6.7	85	3.6	773	32.3
1936	24,837	227	9.1	77	3.1	142	5.7	108	4.4	127	5.1	88	3.6	769	31.0
1937	26,014	244	9.4	62	2.4	177	6.8	95	3.6	137	5.3	97	3.7	812	31.2
1938	27,249	222	8.2	85	3.1	222	8.2	129	4.7	195	7.1	118	4.3	971	35.6
1939	28,833	272	9.4	69	2.4	180	6.2	109	3.8	189	6.6	79	2.7	898	31.1
1940	32,771	288	8.8	106	3.2	212	6.5	116	3.5	166	5.1	102	3.1	990	30.2
1941	35,100	280	8.0	90	2.6	203	5.8	129	3.6	208	5.9	135	3.9	1,045	29.8
1942	33,574	260	7.7	86	2.6	178	5.3	105	3.1	198	5.9	137	4.1	964	28.7
1943	30,311	254	8.4	110	3.6	174	5.8	107	3.5	199	6.6	107	3.5	951	31.4
1944	33,599	289	8.6	86	2.5	184	5.5	133	4.0	205	6.1	115	3.4	1,012	30.1
1945	37,007	312	8.4	92	2.5	201	5.4	120	3.3	194	5.2	117	3.2	1,036	28.0
1946	41,871	344	8.2	124	3.0	207	4.9	124	3.0	164	3.9	130	3.1	1,093	26.1
1947	44,816	360	8.0	133	3.0	202	4.5	115	2.6	200	4.4	112	2.5	1,122	25.0
1948	44,193	295	6.7	129	2.9	182	4.1	92	2.1	175	3.9	97	2.2	970	21.9
1949	43,988	361	8.2	131	3.0	177	4.0	79	1.8	194	4.4	104	2.4	1,046	23.8
1950	44,309	324	7.3	138	3.1	186	4.2	86	2.0	166	3.7	108	2.4	1,008	22.7
1951	44,651	307	6.9	127	2.9	221	4.9	69	1.5	188	4.2	105	2.4	1,017	22.8
1952	46,469	291	6.3	114	2.4	200	4.3	99	2.1	205	4.4	105	2.3	1,014	21.8
1953	46,414	273	5.9	101	2.1	190	4.1	99	2.2	167	3.6	101	2.2	931	20.1
1954	48,431	290	6.0	114	2.4	202	4.2	88	1.8	187	3.8	87	1.8	968	20.0
1955	49,869	320	6.4	96	1.9	172	3.5	117	2.3	198	4.0	99	2.0	1,002	20.1
1956	50,430	325	6.5	78	1.5	181	3.6	89	1.8	203	4.0	102	2.0	978	19.4
1957	51,852	357	6.9	119	2.3	162	3.1	80	1.5	205	4.0	113	2.2	1,036	20.0
1958	53,774	365	6.8	99	1.8	160	3.0	107	2.0	222	4.1	90	1.7	1,043	19.4
1959	54,739	387	7.1	98	1.8	178	3.2	99	1.8	211	3.9	116	2.1	1,089	19.9
1960	55,435	415	7.5	123	2.2	175	3.2	90	1.6	176	3.2	111	2.0	1,090	19.7
1961	57,706	396	6.9	119	2.0	188	3.3	92	1.6	216	3.7	93	1.6	1,104	19.1
1962	57,463	358	6.2	115	2.0	170	3.0	70	1.2	213	3.7	108	1.9	1,034	18.0

* Includes two cases where exact age was not known.

APPENDIX TABLE B - MAORI INFANT MORTALITY - NUMBERS AND RATES BY AGE - 1921-1962

Year	Number of Live births*	Under 1 day		1 day & under 2 days		2 days & under 1 wk		1 wk & under 28 days		28 days and under 6 months		6 months and under 12 months		All Ages Infant Mortality	
		Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births
1921	1,056														
1922	1,442	20	3.4	25	4.2	36	6.1	77	13.0	294	49.6	325	54.8	777	131.0
1923	1,181														
1924	1,246														
1925	1,716														
1926	1,541														
1927	1,495	54	6.1	33	3.7	35	4.0	104	11.8	354	40.2	412	46.8	992	112.6
1928	1,845														
1929	2,216														
1930	2,174	13	6.0	6	2.8	12	5.5	21	9.7	59	27.1	77	35.4	188	86.5
1931	2,372	1	0.4	9	3.8	9	3.8	15	6.3	86	36.3	101	42.6	221	93.2
1932	2,845	12	4.2	15	5.3	8	2.8	26	9.1	101	35.5	100	35.2	262	92.1
1933	3,048	17	5.6	10	3.3	10	3.3	31	10.2	86	28.2	119	39.0	273	89.6
1934	3,071	16	5.2	3	1.0	14	4.6	18	5.9	110	35.8	118	38.4	279	90.9
1935	3,329	20	6.0	9	2.7	14	4.2	36	10.8	122	36.7	154	46.3	355	106.6
1936	3,684	31	8.4	11	3.0	15	4.1	24	6.5	171	46.4	147	39.9	399	108.3
1937	3,997	29	7.3	12	3.0	21	5.3	24	6.0	138	34.5	142	35.5	366	91.6
1938	3,743	31	8.3	15	4.0	22	5.9	44	11.8	181	48.4	273	72.9	566	151.2
1939	4,140	46	11.1	16	3.9	27	6.5	43	10.4	153	37.0	188	45.4	473	114.3
1940	4,295	32	7.5	20	4.7	27	6.3	23	5.4	114	26.5	156	36.3	372	86.6
1941	4,155	33	7.9	12	2.9	29	7.0	37	8.9	177	42.6	229	55.1	517	124.4
1942	4,350	24	5.5	15	3.5	14	3.2	31	7.1	162	37.2	178	40.9	424	97.5
1943	4,450	25	5.6	16	3.6	17	3.8	26	5.8	152	34.2	163	36.6	399	89.7
1944	4,600	24	5.2	17	3.7	10	2.2	36	7.8	176	38.3	198	43.0	461	100.2
1945	4,745	39	8.2	19	4.0	27	5.7	36	7.6	124	26.1	168	35.4	413	87.0
1946	4,820	32	6.6	22	4.6	17	3.5	35	7.3	141	29.3	184	38.2	431	89.4
1947	4,988	51	10.2	15	3.0	24	4.8	37	7.4	121	24.3	117	23.5	365	73.2
1948	4,956	53	10.7	28	5.7	28	5.7	34	6.9	117	23.6	120	24.2	380	76.7
1949	4,917	51	10.4	22	4.5	19	3.9	20	4.1	142	28.9	168	34.2	422	85.8
1950	5,105	60	11.8	43	8.4	19	3.7	23	4.5	112	21.9	99	19.4	356	69.7
1951	5,238	52	9.9	36	6.9	15	2.9	28	5.4	100	19.1	126	24.1	357	68.2
1952	5,459	53	9.7	46	8.4	19	3.5	23	4.2	150	27.5	170	31.1	461	84.5
1953	5,529	61	11.0	44	8.0	15	2.7	28	5.1	135	24.4	121	21.9	404	73.1
1954	5,700	57	10.0	33	5.8	12	2.1	12	2.1	122	21.4	98	17.2	334	58.6
1955	5,807	49	8.4	25	4.3	23	4.0	12	2.1	132	22.7	122	21.0	363	62.5
1956	6,163	61	9.9	18	2.9	29	4.7	15	2.4	121	19.6	91	14.8	335	54.4
1957	6,632	61	9.2	22	3.3	29	4.4	23	3.5	132	19.9	117	17.6	384	57.9
1958	6,861	74	10.8	24	3.5	29	4.2	24	3.5	109	15.9	113	16.5	373	54.4
1959	7,130	63	8.8	24	3.4	21	3.0	29	4.1	141	19.8	110	15.4	388	54.4
1960	7,415	73	9.8	19	2.6	19	2.6	17	2.3	120	16.2	82	11.1	330	44.5
1961	7,770	76	9.8	24	3.1	33	4.3	24	3.1	135	17.4	94	12.1	386	49.7
1962	7,664	51	6.7	26	3.4	19	2.5	19	2.5	103	13.4	79	10.3	297	38.8

*Births from 1923-1946 have been adjusted to year of occurrence and these totals and the rates calculated from them differ from those published by the Department of Statistics.

APPENDIX TABLE C - TOTAL INFANT MORTALITY (EUROPEAN AND MAORI COMBINED) - NUMBERS AND RATES BY AGE - 1930-1962

Year	Number of Live births*	Under 1 day		1 day & under 2 days		2 days & under 1 wk		1 wk & under 28 days		28 days and under 6 months		6 months and under 12 months		All Ages Infant Mortality	
		Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births	Number	Rate per 1000 live births
1930	28,973	237	8.2	94	3.3	212	7.3	153	5.3	241	8.3	175	6.0	1,112	38.4
1931	28,994	191	6.6	110	3.8	189	6.5	148	5.1	231	7.9	208	7.2	1,077	37.1
1932	27,729	176	6.3	102	3.7	166	6.0	147	5.3	252	9.1	196	7.1	1,039	37.5
1933	27,382	212	7.8	80	2.9	180	6.6	151	5.5	236	8.6	184	6.7	1,043	38.1
1934	27,393	237	8.6	85	3.1	167	6.1	118	4.3	251	9.2	202	7.4	1,060	38.7
1935	27,294	216	7.9	81	3.0	175	6.4	135	4.9	282	10.3	239	8.8	1,128	41.3
1936	28,521	258	9.1	88	3.1	157	5.5	132	4.6	298	10.5	235	8.2	1,168	41.0
1937	30,011	273	9.1	74	2.5	198	6.6	119	4.0	275	9.1	239	8.0	1,178	39.3
1938	30,992	253	8.2	100	3.2	244	7.9	173	5.6	376	12.1	391	12.6	1,537	49.6
1939	32,973	318	9.6	85	2.6	207	6.3	152	4.6	342	10.4	267	8.1	1,371	41.6
1940	37,066	320	8.6	126	3.4	239	6.4	139	3.7	280	7.6	258	7.0	1,362	36.7
1941	39,255	313	8.0	102	2.6	232	5.9	166	4.2	385	9.8	364	9.3	1,562	39.8
1942	37,924	284	7.5	101	2.7	192	5.0	136	3.6	360	9.5	315	8.3	1,388	36.6
1943	34,761	279	8.0	126	3.6	191	5.5	133	3.8	351	10.1	270	7.8	1,350	38.8
1944	38,199	313	8.2	103	2.7	194	5.1	169	4.4	381	10.0	313	8.2	1,473	38.6
1945	41,752	351	8.4	111	2.7	228	5.5	156	3.7	318	7.6	285	6.8	1,449	34.7
1946	46,691	376	8.1	146	3.1	224	4.8	159	3.4	305	6.5	314	6.7	1,524	32.6
1947	49,804	411	8.3	148	3.0	226	4.5	152	3.1	321	6.4	229	4.6	1,487	29.9
1948	49,149	348	7.1	157	3.2	210	4.3	126	2.6	292	5.9	217	4.4	1,350	27.5
1949	48,905	412	8.4	153	3.1	196	4.0	99	2.0	336	6.9	272	5.6	1,468	30.0
1950	49,414	384	7.8	181	3.7	205	4.1	109	2.2	278	5.6	207	4.2	1,364	27.6
1951	49,889	359	7.2	163	3.3	236	4.7	97	1.9	288	5.8	231	4.6	1,374	27.5
1952	51,928	344	6.6	160	3.1	219	4.2	122	2.4	355	6.8	275	5.3	1,475	28.4
1953	51,943	334	6.4	145	2.8	205	4.0	127	2.4	302	5.8	222	4.3	1,335	25.7
1954	54,131	347	6.4	147	2.7	214	4.0	100	1.9	309	5.7	185	3.4	1,302	24.1
1955	55,676	369	6.6	121	2.2	195	3.5	129	2.3	330	5.9	221	4.0	1,365	24.5
1956	56,593	386	6.8	96	1.7	210	3.7	104	1.9	324	5.7	193	3.4	1,313	23.2
1957	58,484	418	7.1	141	2.4	191	3.3	103	1.8	337	5.8	230	3.9	1,420	24.3
1958	60,635	439	7.2	123	2.0	189	3.1	131	2.2	331	5.5	203	3.4	1,416	23.4
1959	61,869	450	7.3	122	2.0	199	3.2	128	2.1	352	5.7	226	3.6	1,477	23.9
1960	62,850	488	7.8	142	2.2	194	3.1	107	1.7	296	4.7	193	3.1	1,420	22.6
1961	65,476	472	7.2	143	2.2	221	3.4	116	1.8	351	5.4	187	2.8	1,490	22.8
1962	65,127	409	6.3	141	2.1	189	2.9	89	1.4	316	4.8	187	2.9	1,331	20.4

* Maori births from 1930-1946 in these totals have been adjusted to year of occurrence and the figures and the rates calculated from them differ from those published by the Department of Statistics for those years.

APPENDIX TABLE D - INFANT MORTALITY BY DOMICILE, MAORI, 1959-61
NUMBERS AND RATES PER 1,000 LIVEBORN

Note: Both births and infant deaths allocated by domicile of the mother

Hospital District	Live births	Numbers of deaths			Death rates per 1000 liveborn		
		0-28 days	1 Mth-1 Yr.	Total	0-28 days	1 Mth-1 Yr.	Total
Northland							
Boroughs (semi-urban)	771	27	35	62	35.0	45.4	80.4
Counties (rural portion)	3,748	80	114	194	21.3	30.4	51.8
TOTAL	4,519	107	149	256	23.7	33.0	56.6
Auckland							
Auckland urban	3,933	72	96	168	18.3	24.4	42.7
Boroughs (semi-urban)	456	6	13	19	13.2	28.5	41.7
Counties (rural portion)	686	9	20	29	13.1	29.1	42.2
TOTAL	5,075	87	129	216	17.1	25.4	42.5
Waikato							
Hamilton urban	298	11	9	20	36.9	30.2	67.1
Boroughs (semi-urban)	2,079	57	65	122	27.4	31.2	58.6
Counties (rural portion)	5,529	79	229	308	14.3	41.4	55.7
TOTAL	7,906	147	303	450	18.6	38.3	56.9
Thames							
Boroughs (semi-urban)	186	12	9	21	64.5	48.4	112.9
Counties (rural portion)	309	1	13	14	3.2	42.1	45.3
TOTAL	495	13	22	35	26.3	44.4	70.7
Tauranga							
Boroughs (semi-urban)	302	7	12	19	23.2	39.7	62.9
Counties (rural portion)	955	18	35	53	18.9	36.6	55.5
TOTAL	1,257	25	47	72	20.0	37.4	57.3
Bay of Plenty							
Boroughs (semi-urban)	404	8	8	16	19.8	19.8	39.6
Counties (rural portion)	2,142	31	97	128	14.5	45.3	59.8
TOTAL	2,546	39	105	144	15.3	41.2	56.6
Opotiki							
Boroughs (semi-urban)	198	8	3	11	40.4	15.1	55.5
Counties (rural portion)	607	6	23	29	9.9	37.9	47.8
TOTAL	805	14	26	40	17.4	32.3	49.7
Taumarunui							
Boroughs (semi-urban)	277	9	9	18	32.5	32.5	65.0
Counties (rural portion)	664	17	26	43	25.6	39.1	64.7
TOTAL	941	26	35	61	27.6	37.2	64.8

Hospital District	Live births	Numbers of deaths			Death rates per 1,000 liveborn		
		0-28 days	1 Mth-1 Yr.	Total	0-28 days	1 Mth-1 Yr.	Total
Waiapu							
Counties (rural portion)	1,293	24	45	69	18.6	34.8	53.4
TOTAL	1,293	24	45	69	18.6	34.8	53.4
Cook							
Gisborne urban	526	23	15	38	43.7	28.5	72.2
Counties (rural portion)	1,332	24	36	60	18.0	27.0	45.0
TOTAL	1,858	47	51	98	25.3	27.4	52.7
Wairoa							
Boroughs (semi-urban)	334	16	8	24	47.9	24.0	71.9
Counties (rural portion)	1,020	21	35	56	20.6	34.3	54.9
TOTAL	1,354	37	43	80	27.3	31.8	59.1
Hawke's Bay							
Hastings urban	259	14	7	21	54.1	27.0	81.1
Napier urban	147	-	3	3	-	20.4	20.4
Counties (rural portion)	876	1	16	17	1.1	18.3	19.4
TOTAL	1,282	15	26	41	11.7	20.3	32.0
Waipawa							
Boroughs (semi-urban)	79	3	-	3	38.0	-	38.0
Counties (rural portion)	190	1	6	7	5.3	31.6	36.8
TOTAL	269	4	6	10	14.9	22.3	37.2
Dannevirke							
Boroughs (semi-urban)	72	1	1	2	13.9	13.9	27.8
Counties (rural portion)	149	-	3	3	-	20.1	20.1
TOTAL	221	1	4	5	4.5	18.1	22.6
Taranaki							
New Plymouth urban	92	2	5	7	21.7	54.3	76.1
Boroughs (semi-urban)	154	5	3	8	32.5	19.5	51.9
Counties (rural portion)	306	2	5	7	6.5	16.3	22.9
TOTAL	552	9	13	22	16.3	23.6	39.9
Stratford							
Boroughs (semi-urban)	9	-	-	-	-	-	-
Counties (rural portion)	63	2	2	4	31.7	31.7	63.5
TOTAL	72	2	2	4	27.8	27.8	55.6
Hawera							
Boroughs (semi-urban)	184	5	4	9	27.2	21.7	48.9
Counties (rural portion)	236	3	3	6	12.7	12.7	25.4
TOTAL	420	8	7	15	19.0	16.7	35.7

Hospital District	Live births	Numbers of deaths			Death rates per 1,000 liveborn		
		0-28 days	1 Mth-1 Yr.	Total	0-28 days	1 Mth-1 Yr.	Total
Patea							
Boroughs (semi-urban)	130	2	5	7	15.4	38.5	53.8
Counties (rural portion)	134	4	4	8	29.9	29.9	59.7
TOTAL	264	6	9	15	22.7	34.1	56.8
Wanganui							
Wanganui urban	311	5	10	15	16.1	32.2	48.2
Boroughs (semi-urban)	400	16	19	35	40.0	47.5	87.5
Counties (rural portion)	831	13	36	49	15.6	43.3	59.0
TOTAL	1,542	34	65	99	22.0	42.2	64.2
Palmerston Nth.							
Palm.Nth.urban	104	1	-	1	9.6	-	9.6
Boroughs	381	7	12	19	18.4	31.5	49.9
Rural portion	295	2	12	14	6.8	40.7	47.5
TOTAL	780	10	24	34	12.8	30.8	43.6
Wellington							
Hutt urban	202	5	1	6	24.8	5.0	29.7
Wellington urban	641	13	13	26	20.3	20.3	40.6
Counties (rural portion)	100	1	4	5	10.0	40.0	50.0
TOTAL	943	19	18	37	20.1	19.1	39.2
Wairarapa							
Boroughs (semi-urban)	316	7	12	19	22.2	38.0	60.1
Counties (rural portion)	250	2	3	5	8.0	12.0	20.0
TOTAL	566	9	15	24	15.9	26.6	42.5
All South Island							
Urban	318	9	3	12	28.3	9.4	37.8
Boroughs (semi-urban)	127	4	2	6	31.5	15.7	47.2
Counties (rural portion)	403	12	4	16	29.8	9.9	39.7
TOTAL	848	25	9	34	29.5	10.6	40.1
All N.Z.							
Urban areas	6,831	155	162	317	22.7	23.7	46.4
Boroughs (semi-urban)	6,859	200	220	420	29.2	32.1	61.2
Counties (rural portion)	22,118	353	771	1,124	16.0	34.9	50.8
GRAND TOTALS	35,808	708	1,153	1,861	19.8	32.2	52.2

APPENDIX TABLE E: PERINATAL MORTALITY EUROPEAN AND MAORI 1921-1962 - NUMBERS AND RATES

Year	EUROPEAN						MAORI						TOTAL POPULATION					
	Total births (Live births plus still-births)	Still-births (late foetal deaths)	Early neonatal deaths (deaths under one week)	Peri-natal deaths	Still-births	Peri-natal deaths	Total births (Live births plus still-births)	Still-births (late foetal deaths)	Early neonatal deaths (deaths under one week)	Peri-natal deaths	Still-births	Peri-natal deaths	Total births (Live births plus still-births)	Still-births (late foetal deaths)	Early neonatal deaths (deaths under one week)	Peri-natal deaths	Still-births	Peri-natal deaths
					Rate ≠	Rate ≠					Rate ≠	Rate ≠					Rate ≠	Rate ≠
1921	29,470	903	661	1,564	30.6	53.1	*	*	*	*	*	*	*	*	*	*	*	*
1922	29,848	842	592	1,434	28.2	48.0	*	*	*	*	*	*	*	*	*	*	*	*
1923	28,861	894	577	1,471	31.0	51.0	*	*	*	*	*	*	*	*	*	*	*	*
1924	28,869	855	525	1,380	29.6	47.8	*	*	*	*	*	*	*	*	*	*	*	*
1925	29,014	861	571	1,432	29.7	49.4	*	*	*	*	*	*	*	*	*	*	*	*
1926	29,359	886	583	1,469	30.2	50.0	*	*	*	*	*	*	*	*	*	*	*	*
1927	28,759	878	540	1,418	30.5	49.3	*	*	*	*	*	*	*	*	*	*	*	*
1928	28,039	839	555	1,394	29.9	49.7	*	*	*	*	*	*	*	*	*	*	*	*
1929	27,617	870	492	1,362	31.5	49.3	*	*	*	*	*	*	*	*	*	*	*	*
1930	27,662	865	512	1,377	31.3	49.8	*	*	*	*	*	*	*	*	*	*	*	*
1931	27,431	809	471	1,280	29.5	46.7	*	*	*	*	*	*	*	*	*	*	*	*
1932	25,630	746	409	1,155	29.1	45.1	*	*	*	*	*	*	*	*	*	*	*	*
1933	25,056	722	435	1,157	28.8	46.2	*	*	*	*	*	*	*	*	*	*	*	*
1934	25,009	687	456	1,143	27.5	45.7	*	*	*	*	*	*	*	*	*	*	*	*
1935	24,703	738	429	1,167	29.9	47.2	*	*	*	*	*	*	*	*	*	*	*	*
1936	25,569	732	446	1,178	28.6	46.1	*	*	*	*	*	*	*	*	*	*	*	*
1937	26,775	761	483	1,244	28.4	46.5	*	*	*	*	*	*	*	*	*	*	*	*
1938	27,992	743	529	1,272	26.5	45.4	*	*	*	*	*	*	*	*	*	*	*	*
1939	29,733	900	521	1,421	30.3	47.8	*	*	*	*	*	*	*	*	*	*	*	*
1940	33,736	965	606	1,571	28.6	46.6	*	*	*	*	*	*	*	*	*	*	*	*
1941	36,071	971	573	1,544	26.9	42.8	*	*	*	*	*	*	*	*	*	*	*	*
1942	34,465	891	524	1,415	25.9	41.1	4,404	54	53	107	12.3	24.3	38,869	945	577	1,522	24.3	39.2
1943	31,128	817	538	1,355	26.3	43.5	4,530	80	58	138	17.7	30.5	35,658	897	596	1,493	25.2	41.9
1944	34,398	799	559	1,358	23.2	39.5	4,675	75	51	126	16.3	27.0	39,073	874	610	1,484	22.4	38.0
1945	37,872	865	605	1,470	22.8	38.8	4,850	105	85	190	22.1	39.2	42,722	970	690	1,660	22.8	38.9
1946	42,802	931	675	1,606	21.8	37.5	4,901	81	71	152	13.8	31.0	47,703	1,012	746	1,758	20.8	36.9
1947	45,727	911	695	1,606	19.9	35.1	5,083	95	90	185	18.7	36.4	50,810	1,006	785	1,791	19.8	35.2
1948	45,027	834	606	1,440	18.5	32.0	5,047	91	109	200	18.0	39.6	50,074	925	715	1,640	18.5	32.8
1949	44,784	796	669	1,465	17.8	32.7	5,015	98	92	190	19.5	37.9	49,799	894	761	1,655	18.0	33.2
1950	45,174	865	648	1,513	19.2	33.5	5,211	106	122	228	20.3	43.8	50,385	971	770	1,741	19.3	34.6
1951	45,455	804	655	1,459	17.7	32.1	5,348	110	103	213	20.6	39.8	50,803	914	758	1,672	18.0	32.9
1952	47,315	846	605	1,451	17.9	30.7	5,569	110	118	228	19.8	40.9	52,884	956	723	1,679	18.1	31.7
1953	47,301	887	564	1,451	18.8	30.7	5,651	122	120	242	21.6	42.8	52,952	1,009	684	1,693	19.1	32.0
1954	49,303	872	606	1,478	17.7	30.0	5,811	111	102	213	19.1	36.7	55,114	983	708	1,691	17.8	30.7
1955	50,665	796	588	1,384	15.7	27.3	5,902	95	97	192	16.1	32.5	56,567	891	685	1,576	15.8	27.9
1956	51,288	858	584	1,442	16.7	28.1	6,287	124	108	232	19.7	36.9	57,575	982	692	1,674	17.1	29.1
1957	52,686	834	638	1,472	15.8	27.9	6,734	102	112	214	15.2	31.8	59,420	936	750	1,686	15.8	28.4
1958	54,593	819	624	1,443	15.0	26.4	6,974	113	127	240	16.2	34.4	61,567	932	751	1,683	15.1	27.3
1959	55,544	805	663	1,468	14.5	26.4	7,267	137	108	245	18.9	33.7	62,811	942	771	1,713	15.0	27.3
1960	56,241	806	713	1,519	14.3	27.0	7,496	81	111	192	10.8	25.6	63,737	887	824	1,711	13.9	26.8
1961	58,508	802	703	1,505	13.7	25.7	7,877	107	133	240	13.6	30.5	66,385	909	836	1,745	13.7	26.3
1962	58,189	726	643	1,369	12.5	23.5	7,781	117	96	213	15.0	27.4	65,970	843	739	1,582	12.8	24.0

* Figures not available.
≠ Per 1000 total births.

APPENDIX TABLE F - PERINATAL MORTALITY, EUROPEAN, 1961 - CAUSES OF DEATH

Code No.	Cause of death	Still-births	Early neonatal deaths	Perinatal deaths
	CONGENITAL MALFORMATIONS			
750	Monstrosity	53	9	62
751	Spina bifida and meningocele	7	9	16
752	Congenital hydrocephalus	25	4	29
753	OTHER CONGENITAL MALFORMATIONS OF NERVOUS SYSTEM AND SENSE ORGANS			
.1	Other	3	3	6
754	CONGENITAL MALFORMATIONS OF CIRCULATORY SYSTEM			
.0	Tetralogy of Fallot	-	2	2
.1	Patent ductus arteriosus (Botalli)	-	8	8
.2	Interventricular septal defect	-	2	2
.3	Interauricular septal defect	-	2	2
.4	Fibroelastosis cordis	-	1	1
.5	Other and unspecified malformations of heart	4	9	13
.7	Other circulatory malformations	-	7	7
756	CONGENITAL MALFORMATIONS OF DIGESTIVE SYSTEM			
.1	Imperforate anus	-	2	2
.2	Other	3	16	19
.3	Exomphalus	3	4	7
757	CONGENITAL MALFORMATIONS OF GENITO-URINARY SYSTEM			
.1	Polycystic disease of kidney	-	4	4
.3	Other	2	2	4
758	CONGENITAL MALFORMATIONS OF BONE AND JOINT			
.1	Chondrodystrophy	-	2	2
.6	Other congenital malformations of bone and joint	-	1	1
759	OTHER AND UNSPECIFIED CONGENITAL MALFORMATIONS NOT ELSEWHERE CLASSIFIED			
.0	Of respiratory system	2	1	3
.2	Of muscle	-	1	1
.3	Other and unspecified	8	16	24
760	MECHANICAL BIRTH INJURY TO BRAIN OR SPINAL CORD			
.0	With abnormality of pelvis, mal-position, or disproportion	1	2	3
.1	With abnormality of forces of labour (includes prolonged labour and precipitate birth)	1	9	10
.2	With difficult labour without specific cause	-	2	2
.3	With instrumental or operative delivery	1	2	3
.4	Without mention of cause	5	31	36

Code No.	Cause of death	Still-births	Early neonatal deaths	Perinatal deaths
761	MECHANICAL BIRTH INJURY TO VISCERAL ORGAN, BONE AND NERVE			
.0	With abnormality of pelvis, malposition, or disproportion	-	1	1
.3	With instrumental or operative delivery	-	1	1
.4	Without mention of cause	-	3	3
762	OTHER MECHANICAL INJURY AT BIRTH			
.0	With abnormality of pelvis, malposition, or disproportion	3	1	4
.1	With abnormality of forces of labour (includes prolonged labour and precipitate birth)	1	-	1
763	DIFFICULTIES OF LABOUR WITHOUT MENTION OF BIRTH INJURY, ASPHYXIA OR HYPOXIA			
.0	Abnormalities of bones of pelvis	2	-	2
.1	Disproportion but no mention of abnormality of pelvis	3	-	3
.2	Malposition of foetus	26	-	26
.3	Abnormality of forces of labour	3	-	3
.5	Difficult labour due to other causes	2	-	2
.6	Difficult labour without mention of underlying condition	1	-	1
.7	Operative delivery	5	-	5
.8	Precipitate birth	2	-	2
764	MATERNAL HYPERTENSION AND TOXAEMIA			
.0	Eclampsia	2	2	4
.1	Pre-eclampsia	35	2	37
.2	Hypertension with toxaemia	8	1	9
.3	Hypertension without mention of toxaemia	12	1	13
.4	Other and unspecified toxaemia	34	9	43
765	MATERNAL STATE DURING PREGNANCY OR LABOUR, EXCLUDING TOXAEMIA			
.1	Acute infection	5	1	6
.2	Chemical substance transmitted through placenta, unless stated to have caused asphyxia	1	-	1
.3	Diabetes mellitus	13	2	15
.5	Non-infectious chronic disease of urinary system	2	1	3
.6	Endocrine disturbance	1	-	1
.7	Maternal injury, operation or death	5	-	5
.8	Maternal haemorrhage, NOS	51	13	64
.9	Other maternal states or diseases	20	9	29

Code No.	Cause of death	Still-births	Early neonatal deaths	Perinatal deaths
766	PLACENTA PRAEVIA, PREMATURE SEPARATION OF PLACENTA AND PROLAPSED CORD			
.0	Placenta praevia	11	10	21
.1	Premature separation of normally implanted placenta (abruptio placenta) with maternal toxaemia	10	-	10
.2	Premature separation of placenta, without mention of maternal toxaemia	31	2	33
.3	Prolapsed cord	30	5	35
767	OTHER CONDITIONS ASSOCIATED WITH ASPHYXIA OR HYPOXIA			
.0	Cord conditions other than prolapsed cord	73	7	80
.1	Maternal haemorrhage (excludes maternal haemorrhage without mention of asphyxia or hypoxia (765)	20	12	32
.2	Infarction or other abnormality of placenta	11	1	12
.3	Delayed or difficult extraction	9	2	11
.5	Foetal distress	1	-	1
.6	Atelectasis	5	-	5
.7	Other and unspecified	12	20	32
768	RESPIRATORY CONDITION OF NEWBORN, EXCLUDING PNEUMONIA			
.0	Hyaline membrane disease	-	64	64
.1	Respiratory distress syndrome without mention of hyaline membrane disease	1	3	4
.2	Atelectasis, NOS (to be used for live-born infants only)	-	101	101
.3	Pneumothorax	-	4	4
.4	Aspiration of amniotic fluid	-	9	9
.5	Other	-	36	36
769	INFECTIONS ACQUIRED BEFORE OR DURING BIRTH			
.0	Intra-uterine pneumonia	3	17	20
.7	Other acquired intra-uterine infections	1	-	1
770	HAEMOLYTIC DISEASE OF THE NEWBORN (ERYTHROBLASTOSIS)			
.0	Rh. incompatibility with kernicterus	1	-	1
.4	Rh. incompatibility without mention of kernicterus	48	32	80
.7	Unspecified blood incompatibility without mention of kernicterus	1	2	3
771	HAEMORRHAGE IN FOETUS AND NEWBORN			
.0	Foetal blood loss before birth	4	-	4
.1	Haemorrhagic disease of newborn, NEC	1	21	22

Code No.	Cause of death	Still-births	Early neonatal deaths	Perinatal deaths
772	OTHER SPECIFIED DISEASE			
.0	Kernicterus without mention of blood incompatibility	-	1	1
.1	Icterus or jaundice, NOS	-	1	1
.2	Other	2	8	10
773	IMMATURITY, NOS OR WITH ILL-DEFINED CAUSE	40	139	179
774	ILL-DEFINED CAUSE			
.1	Infarction of placenta. Excludes asphyxia or hypoxia (767)	7	-	7
.3	Other and unspecified abnormality of placenta or membrane	65	2	67
.4	Other cord conditions without mention of asphyxia, hypoxia or compression	11	1	12
.5	Other ill-defined causes(includes intentional termination of pregnancy after 28 weeks)	8	3	11
777	UNKNOWN CAUSE	41	1	42
778	EXTERNAL TRAUMA AFTER BIRTH			
	Traumatic injury to baby after birth	-	1	1
	Total	802	703	1,505

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